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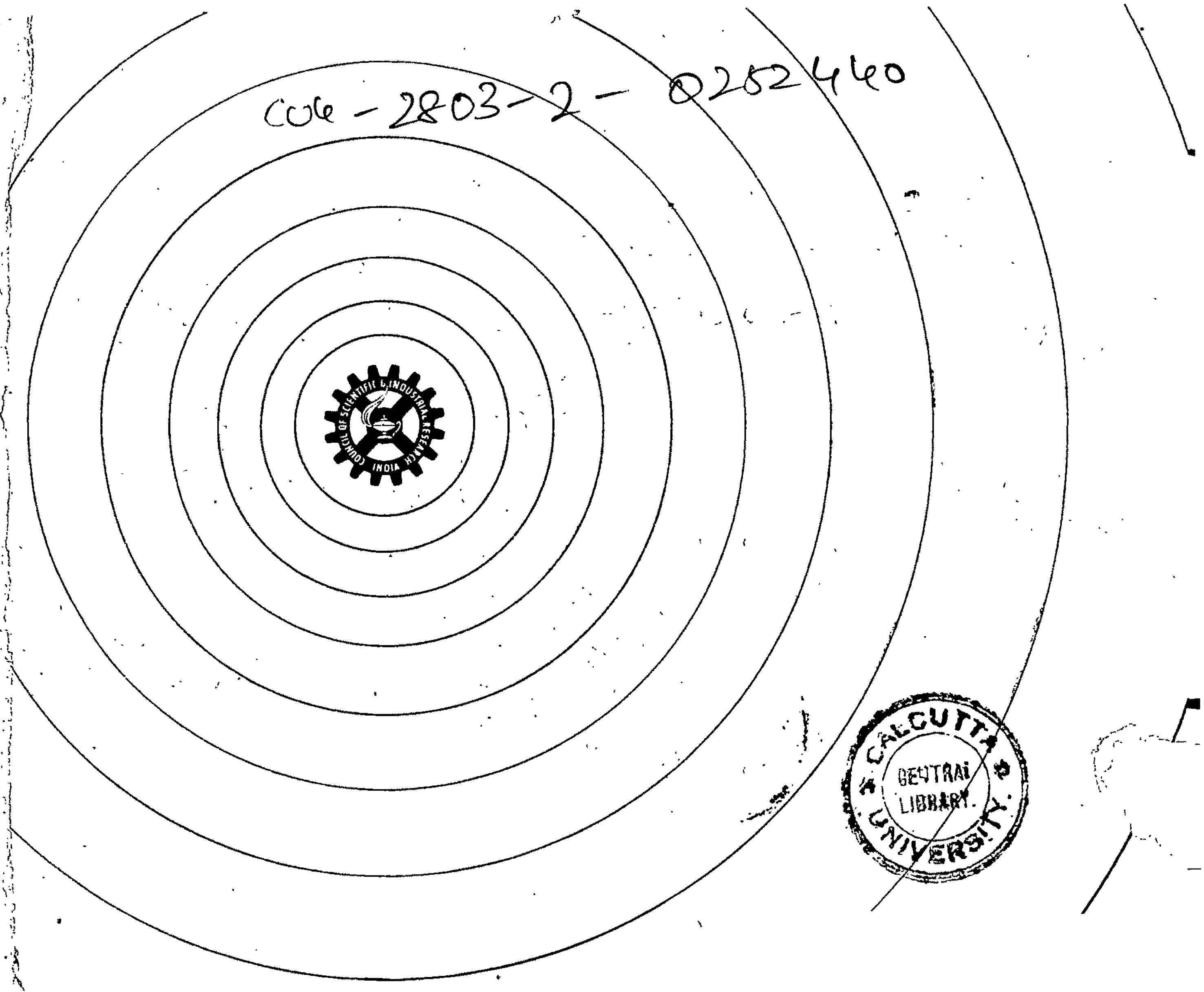

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annals of library science and documentation

INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE DELHI - 12

VOL 12 NO 1 MARCH 1965

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Annals of Library Science and Documentation is published by INSDOC as a quarterly. The dates of publication are 31 March, 30 June, 30 September, and 31 December.

Annals of Library Science and Documentation is a Medium for publishing original contributions in the field of library classification, cataloguing, bibliographic organisation, documentation techniques, mechanical methods of documentation, bibliographic standardisation, etc.

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INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE DELHI - 12

VOLUME 12 1965

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basic position in the field of library science. Your numerous contributions (already recorded in a voluminous bibliography) to the field of library science have been of seminal influence. The postulation of the five fundamental categories has been a signal achievement. The Classification Research Group in England has looked to you for a lot of its inspiration. Your recent address at the Elsinore Conference has been termed a tour-de-force as a topographic survey of classification theory. Sir Maurice Gwyer plumbed your depths and installed you in the University of Delhi, honouring you with the Doctorate of Letters. Ever since, the pattern of the syllabus of library study in this country has taken on the impress of your mould. It has been perhaps fortunate that Sri Avinashilingam Chettiar, one time Minister for Education in the Government of Madras, and a man of vision and passion for libraries, had your advice in bringing into being library legislation in Madras, realising for several millions of people a constant rhythm of library service. It was equally fortuitous that another personality whom the library profession will not forget in a hurry, and whom they will always remember with the greatest respect and gratitude for what he has done to the profession, Dr. C. D. Deshmukh, relied upon you for expert assistance when he invested the universities with a rational, self-respecting pattern in library service, in library building, and in acquisition programmes."

* * *

SEMINAR ON SCIENTIFIC AND TECHNICAL TRANSLATION

[redacted]

1. The Seminar recommends that the Education Ministry be requested to bring into focus the problems vis-a-vis scientific translation apropos the Indian languages by holding a Seminar on that specific topic in cooperation with the Insdoc. Special attention should be paid in this Seminar to the question of the formulation of scientific terminology in the Indian languages apropos the problems of translation.

2. The Seminar recommends to all the scientific organisations, namely the Defence Science Organisation, the Atomic Energy Establishment, the Council of Scientific & Industrial Research, the ATIRA, as also the UGC and the Inter-University Board, that fellowships be awarded to subject specialists for training in scientific translation in foreign and Indian languages either at the Insdoc or in any other organisation which is equipped to impart such training.

3. The Seminar recommends that a general encouragement to scientists to acquire foreign languages should take the shape of tangible incentives such as a pay rise or allowances given to the scientists in recognition of their having acquired a foreign language. The form of such encouragement should best be left to the initiative of the organisation concerned.

4. The Seminar recommends the coordinated decentralization of translating services by the institution of translation cells within the organisations, and regional and central translation pools.

11. The Seminar recommends to the Ministry of Education that in some manner the science talent awards for students at the High School stage be linked up with proficiency in a foreign language other than English.

12. The Seminar recommends to the University Grants Commission that intensive Refresher Courses be held periodically for the teachers of foreign languages

[redacted]

PRODUCTIVITY IN A REPROGRAPHIC UNIT

K S NAGARAJAN
Insdoc Centre, Bangalore

Examines the various factors involved in the planning, organisation, and running of a reprographic unit. Describes the different types of photocopying techniques - fascimile copying, diazo systems, electrographic systems, silver-halide methods, enlargements from microfilm, reflex copying, stabilisation processing, transfer processing, thermography, microcopying etc. - and analyses the cost factor for each process. Factors of effort and time required to produce a copy are also considered for each process. Sets out procedures for quality control in the production of copies with special reference to sharpness of image, legibility, contrast, fidelity to original, avoidance of photochemical or physical blemishes, image permanency, and durability.

1 INTRODUCTION

Facilities for reprographic services have, of necessity, become part and parcel of documentation or scientific information centres throughout the world. Without the myriad methods, machines and materials for reprography and the men to handle and operate them skilfully and to deliver the goods, modern practice of documentation service or information processing is inconceivable. But the very baffling variety in reprographic techniques, and in the design, cost, manoeuverability and versatility of apparatus and materials have brought forth problems in the efficient organisation and management of a reprographic unit. While discharging its functional responsibilities the aim of any reprographic unit should be 'to produce copies of documents in the form, format and quantity desired by the management or the user at minimum cost, with minimum steps in operation and in minimum time but having due regard to optimum quality of the copies consistent with their end-use.' If we assume this as the aim of any reprographic unit, we are faced with a very real management problem -- that of coming to grips with the diverse parameters that affect productivity in the unit and quality of the reprographs produced.

Orderly and systematic processing of scientific and technical information with the tools and techniques (intellectual, mechanical, optical and electronic) now available to documentalists and information scientists, has as one of its prime goals the prompt and proper utilization of new ideas, new techniques, improvements and innovations by men in science, technology and industry so that higher productivity could be achieved everywhere. While purveying the products of our studies and services to push up productivity elsewhere, it is good sometimes to take a close look within our own organisations, examine and locate lacunae, identify shortcomings and in general to ensure enhanced productivity within. This will surely contribute to better, faster and more acceptable service to the consumers of processed information or documentation.

The purpose of this paper is to make such an examination, though not very thoroughly and intensively, and to highlight areas hospitable to fresh approaches in thinking, organizing and execution in the field of reprography. Let us examine briefly the various methods of reprography*, from this angle and in the context of the aim of a reprographic unit stated earlier, with its prime factors of low cost, efforts, and time and high quality.

2 FACSIMILE COPYING TECHNIQUES

The expression facsimile copying is used here in a broad sense, to cover any and every technique which finally yields a copy of the same size as, or a readable near-original-reproduction of, an original document. Thus, systems based on conventional silver-halide materials, diazography, thermography, electrography etc. as well as apparatus having optical devices like the 'Photostat' camera and the 'Xerox' camera or lensless devices for contact copying are all considered, as long as the system/device is meant to produce either a single copy or just a few copies (or an intermediate master for further long-run duplication by other methods) of any document.

---

*For the purpose of this paper, duplicating and near-print processes meant for long run reproduction, are excluded.

3 COST FACTOR

While considering costs, one has, of course, to confine oneself to costs obtaining in one's country or region. Equipment and materials are not manufactured in most of the countries in Asia (excluding Japan), Africa or South America. But for a few simple pieces of equipment like contact printers for silver-halide material and dyeline printers and the more conventional silver-halide photocopying papers and dyeline papers (now being made in India), countries in South-East, South and West Asia have to totally rely on imports. Customs tariff, lincensing and control of imports and foreign exchange control vary from country to country, but generally these tend to inhibit free availability of apparatus and material which are so common place in countries in Europe, America and perhaps Australia. In view of this, our analysis of the cost factor is bound to have a local colour. It is advisable, in this context, for national documentation centres to undertake a systematic study applicable to their countries/regions, of the relative costs of apparatus and materials for the diverse methods of reprography.

The cost of any reprographic copy is made up of visible and invisible elements. Actual cost of sensitive materials, chemicals and other supplies, cost of maintenance of equipment, cost of direct labour involved and electric power consumed make up the direct visible element, while rental of building (rather of that portion where the reprographic unit is situated), cost of water supply, heating, ventilating, air-conditioning, lighting etc. and the depreciation (amortization) on the basic and ancillary equipment used and other managerial and administrative overheads comprise the indirect or invisible element. As a first approximation, we may ignore the fixed indirect costs like administrative overheads and rental of building and facilities, which may be considered common to any or all method(s). Only the recurring costs of supplies and materials and occasional costs of repair/replacement of equipment (or just certain parts of them) need be taken into account, along with depreciation, for such a study, assuming that:

a) wherever indigenous products are available only they are used in preference to imported items;

b) the status and wage level of technical labour employed is the same for operators for all the methods.

A rough relative cost analysis of the various methods is published as a tabulated statement elsewhere[5].

31 Diazo Systems

Diazo systems yield copies having minimum cost per copy. This is becuase size-for-size diazo papers cost about 1/5th of silver-halide papers and the higher initial cost of even the simplest and smallest (imported) dyeline printer having an ultra-violet source (about Rs. 3, 000/-), which is about 6 to 8 times that of an indigenously produced contact printer (capable of handling bound volumes or books) is more than offset by the extreme economy of running/recurring material costs. Though ideally suited to copying of translucent and one-sided originals, diazo equipment and material can be advantageously used to produced either a single copy or multiple copies (upto about 20 or 25) from an intermediate master on thin-base silver-halide paper (obtained by reflex printing from opaque or double-sided originals) either of the negative-positive variety or the direct-positive, pre-exposed variety (based on Herschel effect); the cost of the intermediate master and the diazo copy paper together being less than that of two sheets of silver-halide paper (one required for the negative and another for the positive). Obviously the cost of the intermediate master gets evenly distributed when it is used for multiple copies on diazo. (This has been illustrated by Verry [1, 9] through well-tabulated data as applicable to conditions in U. K.).

32 Electrographic Systems

Next in order of higher cost should be the electrographic systems (Xerography and Electrofax). It is a moot point whether in countries where both diazo materials and electrographic materials are manufactured, the latter may be cheaper even than the former. In India and other countries in the neighbourhood, the prohibitively high intial cost of imported electrographic equipment and the total dependence on imports (assuming import is possible) for either selenium-coated plate for xerography or the zinc oxide-in-resin-binder paper for electrofax and the thermoplastic, tribo-electric resinous powders similar for both, render these novel systems nearly uneconomical in the present circumstances.

33 Silver Halide Methods

Next in order of higher cost come the following silver-halide methods/materials:

a) 'Photostat' type of paper
b) Negative-positive reflex paper
c) Direct-positive paper
d) Transfer reversal ('Copyrapid', 'Gevacopy' or 'Verifax') paper.

For right-reading single copies of opaque originals (c) does not apply, while for translucent originals, if a tonally inverted (right-reading negative) copy is acceptable, in the ascending order of costs the arrangement would be: (b), (a) and (d); and if a black-on-white positive is imperative, then the re-arrangement would be: (c), (b), and (d).

34 Enlargement from Microfilm

There is one other method which is very common, and perhaps most suited to conditions obtained in national documentation centres like the Insdoc, where the demand for photocopies of documents is not sporadic but is continuous and of a large volume. This is the production of enlargements on silver-halide papers (high speed bromide stock like Kodagraph Projection, Gevaert Document Rapid, Agfa Agepe etc.) from an intermediate negative mifrofilm copy. For an occasional or stray demand for photocopies of a few pages for a few short-length documents it will be unwise to resort to microfilming and re-enlarging unless there is a specific request for a dimensional variant of the original i.e. a copy required to be this much smaller or that much larger than the original. But when there is a sustained work-load in a reprographic unit, and especially where the bulk of the original documents whose copies are required are in the form of thick bound volumes of scientific periodicals, an intermediate microfilm becomes not only more economical but the only feasible means of obtaining a readable-size copy indirectly. Contact printers meant for flat-sheet documents can manage to handle only thin and flexible bound documents like reports and single issues of journals; while, even specially designed book copiers cannot take very thick and rigid bound volumes, especially if these have little margin between the text matter and the bound edges of the pages so that adequate coverage and contact become a problem. An excellent analytical study of the design features, capabilities, limitations, operational efficiency and cost of some twenty book copiers either made in or available in the USA, has been made by Hawken[2]. In spite of the proclaimed or proved efficiency, ease of operation and low cost of some, at least, of the book copiers, it should be remembered that microfilming as an intermediate step (when the total volume and continuous influx of work are favourable) will be economical in a documentation centre as equipment for microfilm and, usually, facilities for processing microfilm have to be even otherwise available in a centre rendering national and international service in the various facets of documentation to clientele in scientific and industrial fields.

35 Enlargement through Microcopy-Reader-Printer

An enlarged photocopy ('hard copy' as known in the USA) from microfilm, when a document exists or is available only in this form, can also be made via one of the reader-printers. From a tabulated analysis[3] of some 19 reader-printer equipment (most of them American-made except one from Japan), the initial cost of an apparatus is found to vary from $ 445 to $ 3,600, not considering equipment exclusively designed for large format (70 mm and 105 mm) microfilm like the Itek and Keuffel & Esser makes and those meant for high-volume operation operating on the electrostatic principle (Xerox Copyflo and Bruning Copytron). Information on the recurring cost of sensitive and processing material is not available. But as all the designs are based on one of the time-saving and relatively more expensive processing methods (stabilization or monobath for silver-halide systems and electrolytic or electrostatic for the others), the unit cost per copy is bound to be higher than in the case of diazo systems. But the dual advantage of being able to use one piece of equipment not only just to read the information carried by a microfilm but to be able to produce a hard copy within 10 to 50 seconds without any prior preparation or problems and paraphernalia of darkroom processing, is worth both the initial investment and the little higher recurring cost. By and large, all reader-printer equipment are designed to satisfy only occasional demands for hard copy; they are inherently not economical for continuous and large-volume production of enlargements from microfilm of hundreds or thousands of pages per day. However, they have a place in an internal information centre or a speical library attached to an industrial or research institution, though they are not viable in a large national documentation centre.

4 FACTORS OF EFFORT AND OF TIME

Let us now examine the various facsimile copying methods from the points of view of manual effort involved or the ease of operation inherent in the design of the system as well as of the time required to produce a copy.

41 Reflex-Copying (Conventional)

Conventional reflex-copying technique using contact-speed silver-halide paper, and processing the negative and positive copies in dishes or tanks containing the processing solutions, is largely going out of fashion. This method, though it is best among silver-halide systems in terms of high permanency of image and durability of the copy, it is relatively cumbersome since it involves five distinct steps for the processing of both the negative copy and of the positive: viz. developing, rinsing or stop-bath, fixing, washing and drying, thus needing more time than other methods.

42 Stabilization Processing

The more recent development of stabilization processing eliminates three steps, viz. those of rinsing, washing and drying since the unexposed sensitive emulsion is converted by stabilization into harmless chemical complexes A stabilized negative or print will take only about four minutes as against forty minutes by the former technique. The actual work involved in preparating the photocopy is also much less and is confined to either feeding the exposed paper through two pairs of manually or electrically driven rollers in a simple processing apparatus containing the developer and the stabilizer solutions or swabing over the exposed paper successively with the two solutions on an absorbent porous block

43 Transfer Processing

Still less effort and time are sufficient if the copying is done by one of the transfer reversal methods. Both the diffusion transfer reversal (DTR) method, as exemplified by Copyrapid of Agfa and Gevacopy of Gevaert, and the gelatine transfer reversal (GTR), as exemplified by Kodak's Verifax, are similar in the technique of preparing a copy, though slightly different in the principle of image formation. Here, since both the negative and the positive are obtained simultaneously during transfer processing and peeling-off of the copy paper from the negative or matrix paper, the time and effort involved are much less than the first two methods discussed above. Further economies are possible by using special negative and/or positive papers to obtain multiple copies from one negative after one exposure.

44 Diazography

Equally simple, perhaps less dexterous in operation than the transfer processes, is diazography. There are three techniques available for processing exposed diazo papers. The more classical ones, using either a dye-forming coupler in a liquid 'developer' for the moist technique or ammonia vapour for the completely dry technique, require just about a minute or less of processing time after exposure of the sensitive paper in contact with the original to a source of ultra-violet radiation for a duration between half to three minutes. The total effort involved is slightly less in the dry vapour processing method. The most recent heat developed materials, as exemplified by Kalfax and Diazotherm, should be still more economical in respect of time and effort expended on using them for reprography since heat development is almost simultaneous with exposure.

45 Thermography

The thermographic system is perhaps the simplest and easiest of all since producing a copy requires no more than exposing the sensitive material to the original in one of the pieces of equipment meant for 'Thermofax' or similar material. The visible development of the image is instantaneous during exposure. No separate step of developing, washing or drying is involved. Hence, purely from the point of time and effort involved, thermography is quickest. A copy, in one of the models of Thermofax machines put out by the 3M Co. of

USA (and their associates in the UK and Australia) is claimed to come out in just 4 seconds.

46 Electrography

The electrographic systems, of which Xerography and Electrofax (and its commercial variants) appear to be the more popular, while certainly having the advantages of entirely dry processes, and relatively quicker than older systems still require a few distinct steps. Xerography requires charging of the selenium plate, exposing, powder developing, counter-charging the receiving paper and finally heat-fusing it for permanency. Electrofax is slightly simpler as it dispenses with an expensive selenium plate as well as the need to transfer the image to a separate copy paper.

47 Optical Copy with Silver Halide Materials

Now considering other silver-halide systems employing optical devices, use of an image-erecting camera ('Photostat' type) yielding a right-reading negative copy has fewer operational steps and takes less time than enlarging from an intermediate microfilm, if the microfilm itself has to be produced locally in the same reprographic unit. If, however, as it often happens in a national documentation centre which has to obtain from other centres in the world only a microfilm (in the interests of speedier and cheaper transmission by airmail, having no other alternative to obtain even on loan a 'hard copy' of the required document), the question of using a 'Photostat' type of camera or even any of the facsimile systems discussed earlier does not arise. Both camera-copying and microfilm enlargement rank about the same, in terms of time and effort required, as conventional wet-processes contact-printed silver-halide papers. Stabilization or monobath processing can be employed to cut down time and effort somewhat, but at the cost of fineness of quality and permanency of image. Projection-speed material for transfer processing are made by some manufacturers, which may be used to cut down processing steps and time if a transfer-processing apparatus with squeegee-rollers and guide-grooves is already available in the reprographic unit. The recently announced integral diffusion system (exemplified by the 'Akopositive' material introduced in the USA by the Anken Chemical and Film Corporation of Newton, N. J., USA[4]), should effect some economy of effort and time from the nature of its process, but data are not available to enable comparative studies. Projection-speed material of the diazo type are also available, though they are not as common and as cheap as the contact-speed material universally available to meet enormous demands from drawing offices of engineering industries. Given easy availability and cost comparable with their slow-speed counterpart, diazo-projection-printing materials should be most economical.

Proper programming of operations can effect considerable savings in time and effort involved in producing enlargements from microfilm at an output level of a few hundred prints a day, without use of automatic equipment or continuous processing machines for paper in roll form. Two technicians have been able to produce at Insdoc 400 prints in a day (effective daily working duration 5 hours, excluding time for preparation, tea-breaks etc) and on occasions 600 prints, using a manually focussed enlarger (SFMD, France) and conventional dish processing. Using very fast projection paper like the Gevaert Document Rapid and an enlarger with illumination control, individual print exposures can be as short as one to two seconds (controlled and repeatability ensured by a mercury-switch timer in series with the enlarger lamp). One person does the exposing and the other takes up the sheets for processing in pairs aligned back-to-back inserting two or four pairs of sheets at a time (depending on the size) in the developing dish.

High-speed projection printers using photo-paper in roll form, and having automated frame movement of both microfilm and print-paper, in combination with automatic continuous processors for paper rolls (the individual prints from which are later trimmed off) have been in use elsewhere in centres required to have a very large output. The Army Medical Library (now the National Library of Medicine) in the USA had this arrangement even 10 years back.

To sum up this survey, we may recommend that:

1) Apparatus for dyeline copying (diazography) should be available in a documentation centre to take advantage of the low cost, short time and not-too-many steps involved in making contact copies;
2) To facilitate diazo printing/duplication of opaque and double-sided originals, a con-

ventional contact printer with tungsten-filament or fluorescent illumination should be available;

3) An ideal equipment should be capable of handling both silver-halide and diazo papers i.e. should have both sources of light -- ultra-violet and visible. (A good example is the Printaphot made by Fotoclark, Bonn, Germany);

4) A translucent master, suitable for further reproduction by diazo, should be simultaneously produced when documents are generated within the organisation (like abstracts, bibliographies, translations etc) this is easily achieved by typing with carbon sheets on both sides of a tough translucent tracing sheet (like vellum), which can be one among several ordinary manifold paper sheets on which multiple carbon copies are taken.

5) Similarly, documents produced for mass dissemination, by offset-printing or similar near-print processes (whether periodicals like documentation lists, advance lists of contents etc. or ad hoc occasionals like bulletins, newsletters, brochures, literature surveys etc.) should also have a master copy at least of the contents/abstracts, if not of the whole text, printed on translucent paper stock. (Examples of this are found in the monthly Revue de la Documentation of the FID, The Hague, and in the printing of patents by some European countries). This will facilitate quickest as well as cheapest reproduction from the translucent master by diazo when a few copies are required at short notice, long after the issuance of the publication.

6) For routine work, when time taken is not of utmost consideration, opaque or double-sided originals may be copied via reflex-printed direct-positive silver-halide paper on thin base, which can in turn become the master for diazo printing. Stabilization or transfer processes may be resorted to only in the case of urgent jobs. Conventionally wet-processed reflex negative-positive technique as well as diazo reflex-foils on film-based may be discarded being more expensive on the whole, taking all productivity factors into account.

7) Large volume work and sustained workloads only will justify enlargement through microfilm or continuous electrographic printing.

5 FACTOR OF QUALITY

Aspects of quality of copies which are more important and which have to be under vigilant control to ensure their maximum utility and acceptability are the following:

1) Sharpness of image
2) Legibility
3) Contrast
4) Fidelity to original
    41) Retention of fine detail
    42) Rendition of coloured images in appropriate grey equivalents
5) Freedom from photo-chemical blemishes: fog, stain, discolouration, spots, pinholes, etc.
6) Freedom from physical blemishes: curl, crease, tear, scratch, swollen or peeled emulsion etc.
7) Image permanency and durability of copy.

If, due to want of attention to one or more of these aspects, the finished product is unusable or unacceptable the very purpose of a reprographic service is defeated. Dissatisfaction or even frustration will result in the client or customer, ultimately causing loss of goodwill for the organisation. Therefore, while deciding on a particular method or process of reprography with a view to economise on cost, time and effort involved, the accent on quality, at least to the level of being acceptable for the purpose for which the copy is required, should not be neglected.

Let us now examine the various facsimile processes from the angle of the above aspects of quality.

51 Sharpness of Image

In all the lensless, contact copying techniques this aspect depends upon adequate, thorough and uniform contact between the original and the copying medium. Creation of a partial vacuum over the printing box, use of an air-cushion or a well-sprung lid, special designs for book-copiers (like an inverted-V shaped roof) are some of the devices available for ensuring this. These have been fully discussed elsewhere[2, 5]. Inadequate contact and/or coverage will render the image unsharp either wholly or partially. Control of this aspect can be exercised by inspection of the intermediate negative in the two-step negative-positive reflex method, but in the direct-positive silver-halide, diazo, and transfer methods, inspection has to await the emergence of the final copy after processing. There is no remedy for unsharp copies due to bad contact in contact copying systems or imperfect focussing of optical devices in systems like microfilming, 'Photostat' or 'Xerox' cameras. Unsharpness has to be avoided at any cost.

52 Legibility

While a badly focused optical image or a print (or negative) by poor contact is liable to be illegible, legibility depends also on the size of reproduction. All contact copying techniques yield copies which bear a 1:1 ratio to the original. But a dimensional variant produced by one of the reduction cameras or an enlargement from a microcopy may sometimes be not large enough to allow convenient reading of the text without eye-strain. While economy of sensitive material is an important aspect of cost control, this should not be carried so far as to be obliged to put up with undecipherably tiny characters on the image. The aim should be, in furnishing photocopies which are made through an intermediate reduced-sized negative or by direct reduction in a 'Photostat' type of camera, to give the minimum size print consistent with easy readability of the text. A novel suggestion has been made by no less eminent a person than Ralph R. Shaw[6] to effect economy in consumption of photographic paper and in cost to the consumer of reprographs by supplying 'Photostat' copies of pages of average-size scientific periodicals at about 1/4th of the original size which can then be read conveniently through an inexpensive hand-held magnifying glass. There is no evidence of consumer acceptance of this notion, nor of any attempt to provide a photocopying service as suggested.

53 Contrast

This is an aspect worth paying a lot of attention to. Most photocopies of poor quality happen to be poor due to lack of contrast - contrast in brightness between the dark or black script of the text and bright or white background (vice versa in the case of negative copies like a 'photostat'). Contrast, basically an inherent characteristic of the sensitive material, is easily affected (and is also controllable) by variation in the intensity and spectral quality of the exposing radiation, the composition, vigour, temperature, degree of freshness and of replenishment (or agitation) of the developing agent. Both too low and too high a contrast have to be avoided; it has to be at an optimum level for each method. While quantitative measurement of density levels of the image and the background are not essential a qualitative visual appraisal of the contrast is necessary to ensure satisfactory copies. Sometimes it may be necessary to boost up the contrast of the original (when it has faint script, pencil impressions, faded ink or on ageing coloured paper); on other occasions, it may be desirable to subdue contrast. Normally, all document copying papers of the silver-halide system have inherent high contrast and are recommended to be processed in high-contrast-yielding developers. Photographs, paintings and other continuous tone illustrations have to be copied without enhancing the contrast on 'softer' grade of photographic material (e.g. Agfa Agepe Halftone, Gevaert Document Amplex etc.). When material of softer contrast is not available processing conditions can be varied to control contrast. While silver-halide materials give always adequate and often boosted contrast, diazo materials have lower inherent contrast since the dye image formed (varying from a dark blue to a brown or near-black) is not as dense as a silver image; the back-ground also does not always come out a clear white. The heat-formed dye image of the 'Thermofax' process is still more subdued in contrast, though not really poor. The resinous powder images electrostatically formed and fused onto the paper in the 'Xerox' and 'Electrofax' processes have adequate contrast, in fact too high a contrast while copying solid areas and continuous tones though the 'density' or degree of blackening of the image is not as high as in silver-halide materials; and there is practically no means of effecting contrast control, excepting the use of colour filters which are used in all optical systems and sometimes in contact printing also.

54 Fidelity to the Original

This aspect is of outmost importance in cases of originals having extremely fine script or graphic data (e.g. electronic circuit diagrams, intricate machine drawings on a small scale, chemical structural formulae, camera lucida diagrams of biological specimens under study etc.). Resolving powder both of the sensitive image-forming medium employed and the optics (if any) have a major role in achieving fidelity in terms of reproduction of fine detail. With such delicate or intricate originals, great care has to be taken to optimize the conditions of exposing and developing the image, after making a careful choice of the system to be employed. Due to a tendency to diffusion or spreading of the image, thermographic systems may not be highly suited to the reproduction of extremely fine detail. In general, contact printing methods give better fidelity than projection printing ones. But with high quality optics, as is used in some of the better-designed microfilming equipment, very-high-reduction systems like the Kodak Minicard (integral optical-coded information storage and retrieval system on a sort of unitized microfilm), and all good process cameras meant for making high-resolution negatives for offset-plate-making (also usable for reduction copying on film or paper), there is no difficulty in achieving a high degree of image fidelity to the original, provided, again, exposing and processing are carefully controlled and standardized.

541 Rendition of Colours

Another aspect of fidelity is the rendition of colours in the original. Excepting colour photography, all reprographic systems yield a monochromatic version of all colours in an original. Spectral sensitivities of the various systems vary widely from each other and often from that of the average human eye. Xerography and Electrofax systems somewhat approximate in their colour response to orthochromatic (non-red-sensitive) silver-halide material; however, in common with diazo material they cannot satisfactorily reproduce in the appropriate shade of grey, blue colour, thus necessitating an yellow filter. Violet will reproduce as white via diazo and red as practically white via thermography; the latter system further requires either a carbon or metallic content in the original script and wax-pencilled, inked, or aniline-dyed impressions do not reproduce. Generally, all silver-halide systems will yield better colour rendition along with better contrast if an yellow filter (of appropriate density or depth of colour) is used when the original document has a lot of matter in the blue-green region. Verry [1] indicates some of the controls required to achieve satisfactory monochromatic rendering of colour originals.

55 Freedom from Photo-Chemical Blemishes

Blemishes of a chemical or a photochemical origin can naturally occur only in those systems employing chemically sensitized or chemically processed materials; these comprise all silver-halide and diazo systems. Extremes in exposure (i. e. the combined effect of both the intensity of the exposing radiation and the duration of exposure) will result in poor quality in all systems. In negative-positive silver-halide systems and in thermography over-exposures results in over-darkening of the entire copy, of both the image of the text and the background; and under-exposure yields very faint, sometimes hardly readable copy. In direct-positive systems (diazography, xerography, electrofax and the silver-halide photo-reversal papers like Kodak's 'Autopositive') over-exposure lightens the depth of image and under-exposure results in overall darkness and background density.

Chemical stains and discolouration may occur due to careless processing, use of stale, exhausted chemicals or processing at temperatures far from the optimum, prolonged or uneven processing, inadequate fixation (for silver-halide systems only), or washing (where employed) etc. These are areas requiring attention day-in and day-out in every reprographic unit in the interests of quality control.

Dust, grit, grime, grease or even fingerprints on the glass-tops of contact printers, document- (or book-) holders of microfilm, 'Xerox' or 'Photostat' -type cameras, glass envelopes over the light-sources in dyeline printers (where these are not completely enclosed) may cause very poor quality. Particularly in dyeline printers of the portable type, a layer of dust in the inside of the lamp envelope can cause obscured copies; the latter kind of blemish can occur also in silver-halide copying if dust is not kept off scrupulously. Regular and thorough cleaning of all surfaces coming into contact either with the documents, optical surfaces or light sources must be ensured.

56 Freedom from Physical Blemishes

A number of blemishes of physical origin can spoil the quality of reprographic copies and even impair their usefulness. Caused mostly due to want of care during production, these may take the form of curl, crease, tear, or scratch. Silver-halide material, because of their gelatine content have a tendency to curl inward (on the emulsion side) after drying, especially, in environments of very low humidity. It may be desirable to provide for some humidifying device (in conjunction with air-conditioning in hot climates or seasons) in the workrooms where photocopies are dried, sorted, trimmed and packed for despatch. Tendency to curl is best prevented by using double-side coated photographic papers, but this involves extreme care (and more time) in properly aligning the successive pages (front-and-back) while exposing both sides of the same sheet; a higher rate of rejects is incidental to this technique. Micro-opaque cards like the Microlex, Microcard (on special order) and some others are available on such double-side coated papers just to avoid curl. The other defects like tear, crease, scratch etc. can only be avaoided with proper care during all stages of production.

57 Image Permanency & Durability of Copy

This aspect is a function of the nature of the system as well as of the care exercised in processing. As a rule, among silver-halide copies, conventionally wet-processed and thoroughly washed prints have maximum permanency and durability. Stabilized and transfer-processed papers, though will stay fairly long in sufficiently good condition, may not satisfy archival requirements. The same applies to diazotype copies. Copies made by the electrographic systems will also last without impairment of image quality as long as the paper stock on which they are taken last. All copies on paper stock can take rougher treatment, especially abrasion, during handling, than those on acetate or even polyester films (though the latter are considerably tougher). 'Thermofax' copies, being generally on extremely thin paper stock have to be handled more delicately. All types of copies can last in good condition for a few years, if kept in files or folders, away from direct action of strong actinic light. Normally, considerations of permanence and durability happen to be of great concern to archivists; for purposes of scientific documentation where copies are used only for a short time, there is no need for special attention.

6 MICROCOPYING TECHNIQUES

For the purpose of this paper, let us consider only the productions of 35 mm. ribbon microfilm in rolls or in strips, as this form is the one most commonly used for international exchange of scientific documents. Other micro-transparencies ('Microfiche' in sheet form and unitized microfilm mounted in aperture cards or sleeved in acetate jackets) are getting popular in certain regions and for certain applications, elsewhere in the world. Experience in India is very limited in the production or even use of these forms and formats of transparent microcopy.

61 Cost Factor

Studying the problem in a method similar to that adopted above for facsimile copying, the cost of microfilm production will depend on the type and initial cost of exposing and processing equipment as well as on the recurring cost of materials and chemicals.

When only relatively simple, manually operated equipment (though having precision optics -- like the Leitz Reprovit, Nikon Repro Kit etc.) is employed due to low work-load or only occasional need to produce microfilm the invisible cost due to depreciation is bound to be low as the initial capital cost will be well within Rs. 4, 000/-. On the other hand, with more sophisticated equipment having varying degrees of automation and/or control of production parameters (like automatic focusing, illumination control, automatic film advance, electrically actuated shutter operation, automated camera positioning or setting of reduction ratio, oscillating document stage) etc. capital costs going up to Rs. 10, 000/- (for the 'Microbox' imported from Germany) or Rs. 12, 000/- (for the 'Recordax' Model AH-5 imported from UK) or even higher, the cost of production due to interest on capital and depreciation will be higher. This will be more than offset by greater economies in time and effort afforded by the more refined designs of equipment. Hence from the angle of outlay for equipment the cost of production of microfilm is largely dictated by the work-load available and output desired, which determine the choice of equipment from a wide range. Processing equipment also can range from the cheaper, simpler designs (like the Lumoprint, Micro-Record models) with hand or motor-driven spiral reels and spools rotating in separate tanks of developing and fixing solutions and wash-water or the more expensive more-or-less automated continuous processing machines (like the French Debrie Aiglonne, the American Houston Fearless or Fonda, the Dutch Kinotecnic etc.) depending on the film capacity and output. Unless the production is of the order of a thousand metres or more per day, the automatic continuous processors are not viable for a documentation centre producing microfilms of documents.

Material costs are more or less the same everywhere for silver-halide films, though, in India we find that raw film stock imported from eastern European countries e. g. Afga (Wolfen) from DDR, (against payment in Indian rupees, through state trading agencies) are about a third cheaper than the better-known films of more reliable quality e. g. Agfa Agepe (Leverkusen, Fed. Rep. of Germany), Gevaert Duplocopy(Belgium), Kodak Microfile (UK, USA) etc. Cost of raw stock can be reduced to about 1/2 or 1/3 that of silver films by using diazo films for production of duplicates from a master microfilm for distribution to one, a few or several centres. Processing cost also gets cut down by using diazo film, due to elimination of wet processing in 3 stages as diazo material is processed dry or moist in one step.

62 Factors of Effort and of Time

More time and effort is required per page microfilmed while using the less expensive, simpler and manually operated microfilm cameras and processing equipment. Time and effort can be reduced greatly by use of more expensive, sophisticated and semi-automatic equipment. But it is uneconomical to invest large sums on expensive equipment capable of high output at less effort of skilled labour in short time and to keep the facilities partly idle. Hence, only if the work-load prevalent and turn-over desired are sufficient to keep the more expensive equipment fully utilized, the economies afforded by them can be availed of. In Europe and America, the practice of getting microfilms exposed in a centre processed by commercial agencies outside is prevalent. Again, workload and its continuity have to determine the advisability either of installing in-plant processing facilities or of falling back on commercial outfits, from the point of view of over-all economy, time and effort involved.

63 Factor of Quality

There is a dire need for impressing the need for quality control on all agencies and personnel producing, transmitting and using microfilm, especially when it is employed for international and intra-national exchange of documents. The several aspects of quality where measures of control and standardization have been in progress or are indicated have been delineated by me in detail elsewhere[7, 10]. Donker Duyvis[8] has also made an excellent analytical study of organization and management problems of reprographic services, wherein several aspects of quality of microfilm and its appraisal and control have been admirably discussed. Lewis and Offenhauser[11] have also dealt with this subject adequately. In view of this, it is not proposed to elaborate this factor here. It is, however, to be stressed that want of adherence to any standards of quality of products or non-standard practices during production, transmittal, storage and use of microcopies prevailing in several centres in the world (barring a few), appear to cause considerable hardship to users of microcopies of documents, and adversely affect both the popularity of microforms and extension of their use and indirectly the productivity in reprographic units. The suggestions made in the references cited (Refs. 7, 8 and 10) among others, deserve more widespread attention.

7 CONCLUSION

We have surveyed the factors of cost, effort and time involved in various techniques of reprography. We have also seen the more common causes of poor quality and indicated means of avoiding bad quality or exercising quality control in the various methods of reprography. There is no dearth of informative articles, among published literature, bearing on efficient management leading to higher productivity of reprographic units. But, by and large, these appear to be the result of rather generalized, qualitative appraisal of problems and practices obtaining in some centres undertaken sporadically or on an ad hoc basis.

There is need for a systematic approach, co-ordinated at the national and international levels, towards a continual application of operational research in reprography. The well-known techniques of industrial management, often referred to as 'therbligs' comprising, work study, job analysis, cost analysis, time-and-motion study, human engineering etc. may be applied to the study of the working of reprographic units at different centres, handling different types of documents in different countries under differing conditions of climate, of work-load, and of equipment, facilities and personnel available.

There is plenty of scope for evolving new or better means of keeping down cost, time and effort without impairing quality of reproductions. It is possible in several areas, under suitably modified operative conditions, to dovetail operations; to ensure continuity of work and interchangeability of staff by training a minimum number of operators in many or all available techniques and operations. There is also plenty of scope for standardization: standardization of sizes of reprographic copies; of thickness of bound volumes; of parameters affecting image quality and processing conditions, etc.

These have to be tackled, if the results are to be effective, by the various national documentation centres in conjunction with the respective productivity councils. National organizations connected with reprography (like the National Microfilm Association in the USA and its counterparts in Japan, Australia and UK; the Society of Reprographic Engineers, USA, the Institute of Reprographic Technology, UK, and similar organizations in Germany, the Netherlands etc.) should take an active interest in organizing studies devoted to increasing productivity in reprography. International organisations like the ISO, UNESCO, FID and IFLA may help with finance, co-ordination and administrative help for a series of analytical studies adumbrated above. The various professional associations devoted to reprography and the productivity agencies should come together initially at the national level and later at the international level and put up proposals for such studies to be undertaken on a cooperative and coordinated basis at various governmental. academic and even commercial centres in several countries. In view of the snow-balling development of new techniques and extension of the use of reprographic methods in various walks of human activity, besides scientific documentation, it is imperative that some thought is bestowed to the above proposals by all concerned.

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TRAINING IN DOCUMENTATION IN HUNGARY

P LAZAR
Director General
Hungarian Central Technical
Library and Documentation
Centre, Budapest

Describes the training courses in documentation organised by various organisations in Hungary since 1945. Examines the scope and contents of the different types of courses offered by the National Documentation Centre (1950-52), the CTLDC, the Faculty of Chemistry of the Technical University of Budapest, etc. Evaluates the actual requirements and the existing training facilities in Hungary. Compares the programmes of the courses offered by Insdoc and the Institute of Library Science of the University of Budapest.

1 INTRODUCTION

Training in documentation cannot boast of a long traditional history in Hungary, just like in most of other countries. The organisation of training in documentation is closely connected with the organisation of documentation itself. In this respect, I refer to my paper "Organisation of Documentation in Hungary," (Annals of Library Science and Documentation, 11, 1964, 3-16), where I have described in detail the present organisational set-up and the projected development of documentation.

In this sense, the system of training in documentation should be organised as a corrolary to the projected system of documentation. The setting up and the development of the system envisaged, and the efficient functioning of the system must be based upon the expert knowledge of hundreds and thousands of specialists working in documentation and upon the understanding and active cooperation of ten thousands of specialists who need documentation. This implies a firm knowledge of the principles and techniques of documentation by the documentalists who should be able to select, process and disseminate documentation materials, and a firm knowledge of the services offered by, and of the organisation and methods of documentation by the specialists who are actual and/or potential users of documentation.

It is a well-known fact that documentation has a very complex meaning and embraces several activities ranging from the most simple to the most sophisticated ones. This has naturally an impact upon the training in documentation. As a consequence, various systems of training had been established and developed in most countries interested in the establishment and development of documentation services. Library services and documentation services being closely related links in the all-embracing process of information, it is easy to understand that training in documentation is closely related to training in librarianship. But as documentation, in the proper sense of the word, and library work has to be kept apart as two closely related but no at all identical notions, the same applies to training in documentation and in librarianship.

A detailed account of the system of training of librarians is contained in a manuscript "The Education and Training of Librarians in Hungary" prepared by Prof. Dr. M. Kovacs, Head of the Institute of Library Science of the University of Budapest at the special request of the Institute of Library Science of the Delhi University (available at INSDOC).

2 PAST AND PRESENT

21 Training of Documentalists

The history of documentation in Hungary starts only after the liberation of the country in 1945, though there were several individual attempts ever since the foundation of the

International Bibliographical Institute in 1895 showing the interest of Hungarian scientists in improving international cooperation in bibliography and the existing bibliographical services in the country. But all these efforts were not sufficient neither to establish documentation centres and services nor to organise training in documentation.

211 Documentation Training Course organised by the National Documentation Centre, 1950-52

It was only in 1950 the National Documentation Centre (established 1949) started the first organised training course in documentation with a duration of one year, covering the whole range of documentation activities. The course was attended by more than 100 staff members of the then existing Sectorial Documentation Centres in Science and Technology, Agriculture, Medicine, Economics, and of the central libraries of the country.

The course filled a real gap in the existing training facilities. The success may be judged from the fact that the liquidation of the National Documentation Centre at the end of 1950 did not lead to the stopping of the course which was continued, finished and repeated in 1951-52 by the then Ministry of Culture.

212 Lectures on Methods and Organisation of Documentation at the Institute of Library Science of the University of Budapest 1950-52

In 1950 a compulsory lecture course in methods and organisation of documentation given by the author of this paper has been included into the programme of the Institute of Library Science of the University of Budapest (ILS). This course had to be taken by all the students of the Institute during two semesters with two lecture hours per week. After three years' practice, this course had been abandoned, and some aspects of documentation have been included in the lectures on bibliography.

213 Courses in Special Library Techniques organised by the Central Technical Library and Documentation Centre (CTLDC), 1953-

At about the same time, in 1953, the Central Technical Library and Documentation Centre (CTLDC) inaugurated its first course in special library techniques and documentation for the staff of the special libraries and documentation units of the research institutions and industrial establishments. This was conducted as a one year course during the period of 1953-59. After 1959 it has been transformed into a 2 1/2 years medium-level course of special library techniques (including documentation) with the concurrence of the then established Institute of Library Science and Methodics, particularly the Institute's Training Section. Similar courses have been started and run regularly in other central libraries and documentation centres. The attendance of these courses and the successful passing of a subsequent examination qualify the participants for holding scientific posts in libraries and documentation centres.

The programme of the courses organised by the CTLDC includes some specific topics related to documentation as shown in Table 1.

214 Documentation Courses organised by the CTLDC 1959

As a new and a unique venture, the CTLDC organised in 1959 two four-month courses in documentation with a duration of 32 lecture hours (practical work hours included). About 140 acting special librarians and documentalists from scientific research institutions and industrial establishments attended the courses the programme of which is shown in Table 2.

Because of some controversial issues in the programme and in the lectures, no examinations were held and the course has not been repeated. The expanded text of the lectures has been published by the CTLDC in the volume: Polzovics (J): Bevezetes a szakirodalmi dokumentacioba. Budapest, CTLDC, 1962 (Available at INSDOC).

215 Documentation problems contained in the training programme for Librarians at the Institute of Library Science of the University of Budapest, 1961-

As mentioned above, some problems related to documentation have been included in the training programme of librarians at the ILS. After several years of experience in experimenting on the amount and character of the material to be included in the curriculum, a sort of relative stability has been attained during the recent years. The present situation is described in detail in Tables 3 and 4.

216 Documentation Course organised by the Institute of Library Science of the University of Budapest, 1963-

After careful preparations a special post-university documentation course has been organized by the ILS in concurrence with the CTLDC. The course has been organized for the staff of information and documentation units in research, industry, agriculture, medicine, economics, etc. possessing academic qualification and documentation practice for at least two years. A sound knowledge of at least two foreign languages was another precondition for the attendance. The first of these one year correspondence courses has been started as a pilot course in 1963 and completed with the final examinations held in 1964. The distribution of the participants according to scientific background was highly characteristic: science and technology 23, humanities 6, medicine 1, agriculture 1.

The great success of the course which was attended by 31 specialists made it necessary to continue with this type of training. After a detailed evaluation of the achievements and failures of the pilot course, the ILS and the Ministry of Education accepted the suggestions made by the Working Group on Training in Documentation (WGTD) of the Advisory Committee on Scientific and Technical Documentation of the National Committee for Technical Development (NCTD) to organise a course on similar lines but confined specifically to scientific and technical documentation. This course will be started in 1965. Later on other special courses may follow dealing with problems of documentation in other fields of activities also. The programme of the pilot course (Table 5) as a general course on documentation had to be modified according to the specific needs of science and technology and shifted towards the most important actual problems confronted in this field (Table 6).

22 Training of Users of Documentation

Documentation is intended for the use of subject specialists. If these experts do not make use of the documentation services offered to them, all the efforts put in into organising documentation are lost and the services rendered are useless. But practical experience has proved that subject specialists working in various fields of activity are usually not aware of the potentiality offered by the services of documentation, and they have no experience or practice in utilizing documentation consciously. As a consequence there is in general a rather weak response on part of the potential users of documentation.

This attitude could be basically changed by broadening the outlook of the potential users as regards the utilization of documentation services. After having recognized the basic needs, several steps have been initiated to improve the knowledge of practising experts and would-be specialists about documentation.

221 Training Courses for Engineers 1961 and 1963

The Institute for Post-University Training of Engineers at Budapest has organised courses for engineers in scientific and technical documention. The first course of 12 lecture hours started in 1961 offered a general introduction to the theory and practice of scientific and technical documentation, laying due stress upon up-to-date methods of documentation processing and services (Lazar (P): A korszeru szakirodalmi dokumentacio. Budapest, 1962. Available at INSDOC). The second course of 16 hours started in 1963 dealt with the organisational aspects of documentation including problems on national branch and local level (Lazar (P): A korszerű szakirodalmi dokumentáció. Szervezeti kérdések. Budapest 1964. Available at INSDOC).

Each course has been attended by about 40 specialists, chiefly engineers and scientists working in industrial establishments, and some from research institutes. About half of the participants were already actively engaged in documentation.

222 Training of students of the Faculty of Chemistry of the Technical University of Budapest

The Faculty of Chemistry of the Technical University of Budapest has since several years organised the role and the importance of documentation in chemical research and engineering. The obvious needs of chemical engineers as regards practice in documentation were met by the Faculty by means of organising group lectures and practical training in literature searches and in the efficient utilisation of chemical literature, especially of information materials on chemistry.

3 EVALUATION OF THE ACTUAL REQUIREMENTS AND OF THE EXISTING TRAINING FACILITIES

The WGTD investigated thoroughly into the present situation of training in documentation and formulated the basic principles of the organisation and development of the existing training facilities, taking into consideration the Documentation Development Project endorsed by the NCTD.

31 The basic principles of organisation and development of training in documentation

311 Training of documentalists means special training of subject specialists who had already acquired firm knowledge and practice in one or more subject fields and who need supplementary training in the theory and practice of documentation.

312 The training of full-time and part-time documentalists should be organised on the basis of highly differentiated facilities, according to the actual requirements in the various subject fields and on the various levels of activity and competence. Full use should be made of the existing training facilities.

313 Training facilities on the highest level should be offered to the leading staff of National and Branch Information Offices (BIO) who are engaged in high-level management and organisation and in high-level processing of information materials.

314 A comparatively lower level of training should be offered to the staff of the BIO-s and of the Local Information Units (LIU) as a consequence of their smaller responsibility and of the limited necessities of independent documentation processing activities in the BIO and LIU level owing to the development of the national system of documentation centres

315 Special attention should be offered to the training of part-time documentalists whose contribution to the dissemination and partly to the processing - of information materials is indispensable in the process of documentation.

316 The training facilities offered to special librarians and to the scientific staff of the large central libraries should be revised separately and developed, taking into consideration the specific role of librarian in the storage, retrieval and dissemination of literature.

317 According to the great importance attached to the proper utilisation of documentation services, provisions should be made for the development of highly differentiated training facilities for subject specialists in the utilization of documentation.

32 Evaluation of the Present Training Facilities

321 Training Facilities in Hungary

As stated in section 2, the one-year Documentation Training Course offered by the ILS (see 2.16) is the only regular course which provides at present facilities for the training of documentalists (scientists and technologists) in documentation.

The inclusion of some aspects of documentation in the programmes of training courses for librarians (213 and 214) are to be regarded as very essential for the education of librarians and for the better utilization of library services in science and technology. Special librarians and the scientific staff of the larger central libraries (university libraries for instance) require increased abilities for contributing to the process of documentation, and to provide for broadening the training of librarians in this respect would be very useful. The training programme of librarians already includes some problems related to documentation. But the context of these lectures and the general lay-out of the course as described in detail in Table 3 cannot be regarded as satisfactory from the point of view of training in scientific and technical documentation. The same applies though to a lesser extent, to the courses offered for special librarians at the CTLDC (Table 1).

The extended training facilities in documentation provided for librarians are no alternative to the training in documentation of documentalists, that is scientists and technologists engaged in processing and dissemination of scientific and technical knowledge and experience.

The organisation and the programme of the first course at the ILS as described in Table 5 was not fully satisfactory to the needs of scientific and technical documentation. The principle of differentiation - first of all a differentiation between science and technology, and other disciplines - had to be applied to the course in order to make use of this unique facility as it exists now. The presentation of the various topics of the programme had to be reshaped as a part of the activities concerned with scientific research and technology rather than with librarianship (Table 6).

The ILS, attached to the Faculty of Arts, provides an excellent facility for organising the course according to the specific needs of scientific and technical documentation. The limitations imposed by the non-technical background of the Faculty are expected to present no serious problems as to the immediate utility of these courses so that they are expected to form - at least for a period of 4-5 years - a continuous training facility for about 40 documentalists per year.

322 A Comparison of the Programmes of the Documentation Courses offered by INSDOC and by the Institute of Library Science of the University of Budapest

As the documentation courses offered by the ILS and by INSDOC have similar aims namely to convey a fairly comprehensive view of the most important problems of documentation, it proved to be most interesting and useful to make a systematic comparison of the programmes of the two courses. The breakdown of the INSDOC course according to subjects is shown in Table 7, whereas Table 6 gives the detailed programme of the ILS course.

By preparing rough concordance table (Table 8) based upon Table 6 and 7 striking differences and similarities may be detected regarding the structure of the two courses. Even taking into consideration the different basic characteristics of the two courses, the INSDOC course being a one-year full-time day-course, and the ILS course being a one-year correspondence course.

In both fields of Table 8 relating to the INSDOC course and the ILS course, the first column contains the serial nos. of the subjects according to the enumeration in Table 7 and 6 respectively. The second column shows the time allotted to each subject as a percentage of the whole teaching and working time.

The third column should be interpreted as those percentages of the topics involved in the subjects enumerated in column 1 which correspond directly to each other. For instance, the first line under I. Corresponding topics reflects the fact that subject 1 of the INSDOC course is covered in the ILS course exclusively by subject 3 (with a percentage allotment of 5% of the teaching and working hours), but only 60% of the topics of subject 3 in the ILS course correspond directly to the topics contained in subject 1 of the INSDOC course.

The distinction between corresponding and non-corresponding topics is necessary because there are obviously parts in both courses without any corresponding part in the other.

In some cases the topics contained in one subject in one course are scattered in two or more subjects with corresponding topics in the other course.

The figures in the fourth column show the percentage of the whole course covered by the corresponding topics, and they may be calculated by multiplying the corresponding figures in columns 2 and 3 and dividing by 100.

Resulting out of the detailed comparisons the following percentage breakdown may be calculated for the two courses:

	INSDOC %	ILS %
Library science	25	8.5
Classification	10	9.8
Cataloguing and indexing	10	6.2
Documentation	22.5	37.6
Mechanization of documentation	25	16
Corresponding topics	92.5	78.1
Non-corresponding topics	7.5	21.9
Total	100	100

The ILS course reflects very clearly the conviction that training in library science and in documentation has to be differentiated whereas the INSDOC course lays stress upon library science and documentation about equally. This striking difference may be attributed partly to the idea of regarding documentation as an extension - or even as a part - of library science, which prevails to a large extent among the leading librarians and library schools in India, and partly to the fact that both the library and the documentation sciences are to be regarded as largely underdeveloped in most scientific and industrial institution.

33 Future Development of Training Facilities

A comprehensive picture of the existing and the projected training facilities is shown in Table 9 detailed according to the training of documentalists, librarians, other specialised staff of documentation units and users of documentation.

331 Training of Staff of Documentation Units

3311 Documentalists

As pointed out in 32 the only training facilities at present are provided by the ILS. This course should be developed and stabilised according to the trends made clear in 32.

As the requirements in full-time and part-time staff by far exceed the capacity for training of the Institute of Library Science, there is great need for organising other courses, preferably at the Technical University of Budapest. This institution is provided or may be relatively easily provided with the mechanical equipment and machinery necessary for the training of documentalists in up-to-date methods of documentation. The teaching staff is to a great extent personally involved in some documentation activities, many of the professors and other members of the teaching staff being part-time contributors to documentation services. The most important justification for high level documentation courses to be organised by the Technical University of Budapest lies in the fact that systematic post-graduate training of engineers and scientists may be organised most efficiently in an educational institution with engineering and scientific background.

The training projected at the Technical University of Budapest should be meant for training of engineers and scientists in theory, practice, management and organisation of documentation. The one-year course should be differentiated into two parallel courses according to the status and responsibilities of the participants.

The first course should be organised for the leading staff of national and branch documentation units, whereas the second course may be attended by the staff of the institutions mentioned and by the staff of the local documentation units. The tentative programmes of these two courses are shown in Table 9 and 10.

As the course offered by the Institute of Library Science may be attended by about 40 specialists and the two courses offered by the Technical University of Budapest by about 20 and 40 specialists respectively, the planned capacity of these three courses will come to about 100 specialists per year. This means that by organising and developing these courses as explained above, about 400-500 specialists may receive adequate training in documentation in the next 5 years.

The training of about 100 specialists per year would be in itself a great achievement compared with the past, but the needs are by far out growing these facilities. Therefore there is necessity for organising special courses by other institutions in addition to the universities. Quite obviously it lies within the responsibility of CTLDC, the information offices of the ministries and the BIO-s to provide facilities for training in specific aspects of documentation. A detailed project has to be worked out in the near future to evaluate the possibilities and to assess the tasks of each type of these documentation centres in training of documentalists.

3312 Translators

The training of translators is unsolved at present. After the short-lived School of Foreign Languages ceased its activities in the early fifties, no special facility has been available for training of translators. The Arts Faculties of the Universities cannot afford to teach students who want to take up the career of a translator, as the limited training facilities in modern languages are reserved for training of high school teachers. The stray efforts made by some of the documentation centres and translation bureaus failed because of inadequate preparation and lack of interest on the part of both, the translators and the centres.

There is some hope that the Ministry of Education will shortly find a solution to this very acute problem by setting up a special institution similar to the School of Foreign Languages already mentioned. The institution will provide for the training of translators and interpreters.

The contribution of the CTLDC and the BIO-s to the training of translators should be confined mostly to conveying the requirements of scientific and technical documentation to the Ministry of Education and to the institution responsible for the training of translators. The future experiences of INSDOC in organising and running a six months training course in scientific and technical translation may be most valuable for giving an impetus for the arrangement of similar special courses in Hungary.

3313 Other Specialist Staff

The training of the specialist staff of the technical services (printing, reprography, photography, etc. is confined, and should be confined also in the future, to the existing educational institutions, as for instance the Technical University of Budapest as regards high level printing specialists, various technical schools and training courses for the training of printers, reprographers, photographers, etc. The CTLDC should convey in its capacity as the national centre for scientific and technical documentation the specific requirements of documentation which should be taken into consideration by the interested educational institutions while drawing up and implementing training programmes.

332 Training of Users of Documentation

3321 Engineers and Scientists

This task should be attributed to the documentation centres on various levels and to the Institute of Post-University Training of Engineers at Budapest. Besides that, adequate assistance could be offered in this respect by the scientific and technical societies which could regularly provide lectures and training courses in documentation for their members.

3322 University Students

The training in documentation of the students of the Technical Universities and similar educational institutions as the potential users of scientific and technical documentation should be organised in three stages:

a) Introduction into the use of the centre of library of the university, shortly after entering the university.

b) Training course of one or two lecture hours and practice weekly for at least one semesters.

c) Documentation practice related to the preparation of the theses for final examination.

The tentative programme of the training course, mentioned above under (b) is shown in Table 11. Similar courses have been already introduced in the USSR at the Faculty of Science of the Moscow University.

Table 1: Specific questions of documentation included in the programme of the 2 1/2 years medium-level course in special library techniques of the CTLDC*

a) Inlcuded in the lectures on Library Techniques

- Documentation in general
- Documentation of special literature
- Concise history of documentation in Hungary
- Documentation services of the CTLDC
- Translation services, the National Register of Translations
- Organisation of documentation in Hungary, division of labour between institutions on various levels
- Organisation of documentation abroad and on international level
- Punched card techniques
  - edge-punched cards
  - Peek-a-Boo cards
- Reprography

b) Included in the lectures on Types of Publications, Sources of Information:

- Primary sources
- Secondary sources
  - literature searches
  - abstracting services
  - indexing services
  - retrieval practice.

Table 2: The programme of the Documentation Training Course offered by the CTLDC, 1959

1 Theoretical part

11 The definition of documentation. The role of documentation and its inter-relations with library work. The evolution of documentation and its present situation in Hungary.

12 Organisational forms of documentation. Centralised and decentralised documentation. Organisation of documentation abroad. International organisations of documentation.

13 Sources of documentation. Processing of literature. Forms of processing. Documentation and copyright. Standardisation in documentation.

14 Dissemination of documentation materials. Editing. Traditional documentation services: abstracting and indexing services, card services.

15 New types of documentation services: Special types of bibliographic control, "express" service, reviews of literature.

16 Retrospective documentation services: special bibliographies, thematical documentation.

17 Translations. Methodics of translation. Efficiency and economic use of translations. Elimination of unnecessary parallelism in translation.

18 Machinery and equipment for documentation including reprography.

2 Practical part

21 Survey of foreign documentation services in various fields of science and technology.

22 Practice of documentation processing. Translations of titles, preparation of indicative and informative abstracts.

23 Problems of technical language and technical terminology.

24 Literature searches.

25 Reprography and mechanical selection.

Table 3: Detailed programme of the Training Course in Librarianship (day-course) at the Institute of Library Science of the University of Budapest*

No.	Subject	Hours per week									
		I	II	III	IV	V	VI	VII	VIII	IX	X
		Semester									
I.	Library and documentation										
1.	Basic bibliology	2	-	-	-	-	-	-	-	-	-
2.	Reader and reading studies	-	-	2	-	-	-	-	-	-	-
3.	Fundamentals of public education	-	-	-	2	-	-	-	-	-	-
4.	Theory & history of cataloguing	1	1	-	-	-	-	-	-	-	-
5.	Theory & history of classification	-	1	1	-	-	-	-	-	-	-
6.	Cataloguing practice	2	2	-	-	-	-	-	-	-	-
7.	Classification practice	-	2	2	-	-	-	-	-	-	-
8.	Cataloguing & classification practice	-	-	-	2	-	-	-	-	-	-
9.	History of the book and of libraries	3	2	2	3	-	-	-	-	-	-
10.	History of the press	-	-	2	-	-	-	-	-	-	-
11.	Bibliography & documentation	-	-	-	-	2	2	2	2	-	-
12.	Bibliological practice	-	-	-	-	2	2	2	2	-	-
13.	Library Science	-	-	-	-	2	2	2	1	-	-
14.	Seminar on library science	2	1	1	1	2	2	1	1	1	1
15.	Special seminars	-	-	-	-	-	-	2	2	2	2

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* Compulsory practice in libraries not included.

No.	Subject	Hours per week									
		I	II	III	IV	V	VI	VII	VIII	IX	X
		Semester									
II.	General subjects										
1.	Logic	2	-	-	-	-	-	-	-	-	-
2.	Political economy	3	3	-	-	-	-	-	-	-	-
3.	Philosophy	-	-	2	3	3	-	-	-	-	-
4.	Scientific socialism	-	-	-	-	-	-	4	4	-	-
5.	Ethics	-	-	-	-	-	-	2	-	-	-
6.	Aesthetics	-	-	-	-	-	2	-	-	-	-
7.	General psychology	-	2	-	-	-	-	-	-	-	-
8.	Educational psychology	-	-	2	-	-	-	-	-	-	-
9.	History of education	-	-	-	2	-	-	-	-	-	-
10.	Seminar on pedagogics	-	-	-	-	-	-	-	-	-	1
11.	Education practice	-	-	-	-	2	2	-	-	-	-
12.	Teaching practice	-	-	-	-	-	-	-	-	12	-
III.	Foreign languages										
1.	Russian	2	2	2	-	-	-	-	-	-	-
2.	Second modern language	-	-	-	2	2	2	2	-	-	-
IV.	Second special subject field (besides Librarianship)										
	According to the subject field	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10	8-10

Table 4: Specific questions of documentation included in the programme of the Training Course for Librarianship (day-course) at the Institute of Library Science of the University of Budapest.

1 In: Basic bibliology

The definition and scope of bibliography and documentation. The problems of bibliological classification. The methods of literature searches.

2 Theory, history and practice of library classification

Theory. The definition of classification. The logical bases of classification. The general methodology of library classification. Enumerative and analytico-synthetical classifications. The general structure of systematic classifications. Systems of notations, types and functions of the notations. Special classification schemes. General principles of designing special schemes. The Universal Decimal Classification. Classification by indexing.

History. The effects of historical and social development on library classification. Library classification and the classification of sciences. Outstanding classification schemes of the ancient and Middle Ages. The development of library classification following the invention of printing. The emergence of theoretical problems in library classification. The influence of Bacon and of other philosophical trends in modern times. The most important classification schemes prior to the introduction of the Decimal Classification. Classification schemes of the large national libraries. The Decimal Classification of Dewey. Description and criticism of the Universal Decimal Classification. Development of UDC. Other recent universal classification based on bourgeois ideology. Classification of sciences by Engels. The marxist classification of sciences and the development of the marxist library classification system.

3 In: Bibliography and documentation

The definition of bibliography, its social functions and significance in the socialist society. Types and forms of bibliographies. The methodology of their analysis. Definition of the bibliographic unit. The boundaries of bibliography. Bibliography and the library catalogue. Bibliography and documentation.

General bibliographies. Their role in the utilization of literature.

Universal international bibliographies.

Library catalogues replacing universal international bibliographies. Union catalogues. Printed catalogues of large libraries.

Forms of bibliographies of bibliographies and their historical development. Description and analysis of the most outstanding bibliographies of bibliographies, their role in information.

Development of the national bibliography. The role of the book trade in the creation and development of national bibliographies. The registration of the national literature as a social function. Types and forms of national bibliographies. Important foreign national bibliographies.

Hungarian current national bibliography prior to and after the liberation of the country in 1945.

Bibliographies of periodicals, and articles in periodicals. Union catalogues of periodicals. International indexes of articles. Bibliographies and indexes of Hungarian periodicals.

Types and forms of special bibliographies. Methods of preparing special bibliographies. Scientific and technical information and the special bibliographies. The role and significance of retrospective and current, national and international special bibliographies. Survey of the most important bibliographical sources of social sciences/ primarily of marxism-leninism, dialectic and historical materialism, philosophy, and literature, history of art, etc./ and of natural science / primarily of mathematics, physics, chemistry, biology, geology etc./. Analysis and practical utilization of bibliographical sources in reference work.

Needs of specialists in engineering, agriculture, medicine etc. in literature searches. Problems of the bibliographic control of literature. Evaluation of the contents of articles in periodicals.

Methods and techniques of literature searches.

Definition of documentation. Bibliographic and documentary unit. Exact determination of the theme, the literature on which is to be retrieved by documentation. Interrelations of bibliography and documentation. The development and present forms of abstracting. The character and purpose of abstracts. Principles of abstracting. Annotations, recensions, reviews of literature as means of information.

The All-Union Institute of Scientific and Technical Documentation of the Soviet Academy of Sciences (VINITI). Documentation in the other socialist countries. Documentation in Western countries. The development and the most important institutions of the network of documentation centres in Hungary.

General characteristics of the documentation work. Forms of documentation. The historical development of documentation. Centralised and decentralized documentation. National and international organizations of documentation.

Documentation and information. Modern documentation methods. Library methods of information storage. Actual achievements and future possibilities of mechanical storage and retrieval of information. Mechanical translation. The importance of library classification in documentation. Methods of information retrieval methods.

The use of documentation in practice and research. Needs and requirements. Editing of information materials. Dissemination of information materials. The possibilities, means and efficiency of the complex information activity.

The literature on documentation.

4 Bibliographical practice

Bibliological practice should primarily be meant to promote the understanding of the most important publications in the following disciplines: philosophy, pedagogics, history, arts, physics, chemistry, engineering sciences, biology and agriculture.

In addition, if necessary, other topics may also be included / such as economics, literature, mathematics, medical sciences, etc. /.

In course of the bibliological practices, the following topics should be dealt with relation to the disciplines mentioned above:

Object and methodology of the discipline specified. Development of scientific thinking. Recent trends of development in scientific research in socialist countries and in other countries. Outstanding foreign and Hungarian literature: encyclopedias, manuals, bibliographies, documentation publications, periodicals. Libraries and documentation centres.

Table 5: Programme of the one-year Documentation Training Course offered by the Institute of Library Science of the University of Budapest, 1963-64.

1. Science policy	2 hours
2. Documentation in general	28 hours
3. Bibliography	18 hours
4. Classification	12 hours
5. Documentation in science or technology or agriculture or social science (differentiated lectures and practical work)	16 hours
6. Librarianship	12 hours
7. Preparation and editing of manuscripts	6 hours
8. Reprography	6 hours
9. Mechanization	8 hours
Total:	108 hours

Table 6: Detailed programme of the one-year Scientific and Technical Documentation Training Course offered by the Institute of Library Science of the University of Budapest, 1965.

1. Policy of science, education and economics -6 lectures

Science and society. Science as a productive force. Levels of scientific research. Material conditions, staff and organization of research and development. The long range national plan of scientific research. International cooperation in research and development. The role and significance of information in research and development.

2. The theoretical basis of documentation

Definition and meaning, scope and function of documentation. Technical, scientific and economic documentation; its collective definition as technical documentation. Technico-scientific documentation and technico-industrial documentation. Certain basic questions of terminology: the meaning of documentation, information, technical propaganda. Documentation as a science discipline. The literature on documentation: periodicals, fundamental textbooks and manuals. The vocation, training and qualification of documentalist.

3. Library Science - 6 lectures

The position and role of the libraries within the written forms of communication. The past development and the present functions of the most important types of libraries. Library networks and systems. The present library organisation and system in Hungary: main trends and problems of further development. The main problems of acquisition. Catalogues and their use. Storage, particular problems of special libraries. Library and information. Types and forms of readers' service. Lending, interlibrary lending. Union catalogues, Readers' service in special libraries. Training of librarians. The role of librarians in meeting documentation needs by up-to-date methods.

4. Sources of documentation - 8 lectures

Types of sources of scientific and technical literature in general. Characteristics of contents, specific properties and information-value of different types of literature. Primary documents (books, monographs, research reports, paper in periodicals, patent specifications, standards, trade literature etc.) with respect to documentation processing. Specific publications of scientific information (encyclopedias, vocabularies, dictionaries, data sources and graphs, guides, design aids, maps etc.), characteristics of contents and form, utilization in information retrieval.

5. Bibliography - 10 lectures

The role and importance of bibliographies in scientific and technical information. Information value of general and special bibliographies. National bibliographies, their role and utilization in documentation, with particular respect to the bibliographic registration of various types of publication, Bibliographic registration of periodicals. Union catalogues of periodicals, General bibliographies of periodicals. National and international indexing services. The recommendation bibliography, as an aid to scientific and technical information. Bibliographic description of documents.

6. Documentation processing and services - 20 lectures

Definition of the information value of documents. Selection system based on relative completeness. Special problems of selection in the course of processing. Processing by full-time staff or part-time specialists. Forms and methods of processing. Annotation, Recension, Abstracts as the fundamental form of processing. The importance of indexing in processing. Abstracts rendering "full" information. Reviews of literature. Methodology for the evaluation of the contents of original publications. Rules of bibliographic description in documentation. Publication of processed documentation material. Classical documentation services; abstracting journals and card services. New types of documentation services for satisfying differentiated needs: "express" services, services rendering "full" information. Various types of existing documentation services in Hungary.

The role and importance of translation in documentation. Organizational, linguistic and utilization problems of translations, Problems of dictionaries.

7. Classification and indexing - 15 lectures

The fundamental problems of classification. Classification of science and literature. Meaning, purpose and methods of classification. The rules of logics of classification. The concept and its essential characteristics, the basis for classification. The concept and scientific definition. Classification methodology; ideas, notation, code symbols. Types of notations. Functions of notations. Structure of classification schemes: logical and numerical notational design. Enumerative and analytico-synthetic classifications. The Universal Decimal Classification, history appraisal, development, structure, notations, practical utilization. Modern trends in classification. Analytical systems. Facet classification. General and special classification schemes. International classification schemes. Theory and practice of indexing. Indexing methods and schemes. Key-words. Uniterms etc.

8. Theory and practice of literature searches - 8 lectures

The role and importance of literature searches in documentation. Theory and methods of information retrieval. Methods of literature searches. Sources for systematical literature searches. Characteristics, information value and utility of special bibliographies, catalogues, abstracting and indexing services, card services, digests, reviews etc. Structure and organisation of indexes for information retrieval. Correct determination of the purpose and of the contents of literature searches. Practical literature searching on differentiated topics.

9. Mechanization of documentation - 10 lectures

The present state of art in conventional and non-conventional storage and retrieval of information. Manual punched- cards (edge punched and field punched cards, Peak-a-Boo cards), coding, utilization. Machine punched cards techniques (Hollerith, IBM etc.) Punched cards and reprography. Utilization of punched cards for documentation in Hungary and abroad. Telecommunication systems (telex etc.). Mechanical abstracting and classification, storage and retrieval by means of electronic computers and other machines. Mechanical translation.

10. Preparation of manuscripts and editing of information materials - 10 lectures

Author and editor, their role and tasks. Contract, copyright, royalties. The contents aspects of editing. Requirements of the printing shop in relation to manuscripts: typing, orthography, footnotes, bibliographical references, indexes, instructions for typesetting etc. Proof corrections. Fundamentals of printing, lettertypes and sizes, type-setting etc. Visit to a printing shop. Language and style exercises. Editorial principles of documentation publications. Types and forms of abstracting journals, arrangement of the contents. Editing of card services. Editing of publications intended to meet highly differentiated requirements. Editorial methods to produce speedy documentation services.

11. Documentation reprography - 8 lectures

Scope and classification of reprographic processes and equipment. Various types of reproduction and copying processes: adrema, ormig, stencil, offset, xerox etc. Economic aspects. Microphotography, Microfilm, microcard, microprint. Cameras and reading machines. Recent trends in reprography.

12. Planning and organization of documentation - 6 lectures

Principles and methods of planning and organization. Economic planning and documentation programming. The analysis of unit operations in documentation, labour and time requirements. Planning and organization of documentation in documentation centres of ministries, branch centres and local units. The national network of documentation. National system of planning and reporting in documentation activity. Organization of documentation abroad. International organization of documentation.

Table 7: One-year training course in documentation and reprography offered by INSDOC[1] [2]

1. Library science

Organisation. Administration. Technical services.

2. Library science

Reference service. Bibliography.

3. Pattern of knowledge. Classification.

4. Cataloguing and indexing

5. Documentation

Development of the concept of documentation. Experiments at international level. Needs of developing countries. Scope for future developments. Types of documentation centres. Documentation work.

6. Documentation

Literature search technique. Procurement of documents. Translation service.

7. Information storage and retrieval

8. Reprographic methods

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1) Indian National Scientific Documentation Centre. Training Course in Documentation and Reprography. Prospectus & Syllabus 1964-65. New Delhi, INSDOC, 1964.

2) The teaching and working hours are by and large equally alloted to the 8 chapters of the course.

Table 8: Concordance between the programmes of the Documentation Training courses of INSDOC and of the Institute of Library Science, University of Budapest

INSDOC Course1)				ILS Course2)				
Serial No. 1)	% weight	% covered of Serial No.	% covered of Course	Serial No. 2)	% weight	% covered of Serial No.	% covered of Course	
I. Corresponding topics								
1.	12.5	100	12.5	3.	5	60		3
2.	12.5	100	12.5	3.	5	20	1	
				5.	9	50	4.5	5.5
3.	12.5	80	10	1.	5	40	2	
				7.	13	60	7.8	9.8
4.	12.5	80	10	3.	5	20	1	
				7.	13	40	5.2	6.2
5.	12.5	100	12.5	2.	7	50	3.5	
				6.	17	30	5.1	
				12.	5	40	2	10.6
6.	12.5	80	10	4.	7	100	7	
				5.	9	50	4.5	
				6.	17	50	8.5	
				8.	7	100	7	27
7.	12.5	100	12.5	9.	9	100		9
8.	12.5	100	12.5	11.	7	100		7
Total	100	92.5	92.5	Total	100	78.1		78.1
II. Non-Corresponding topics								
3.	12.5	20	2.5	1.	5	60		3
4.	12.5	20	2.5	2.	7	50		3.5
6.	12.5	20	2.5	6.	17	20		3.4
				10.	9	100		9
				12.	5	60		3
Total	37.5	20	7.5	Total	43	50		21.9
Grand total	-	-	100	Grand total	-	-		100

1) In details see Table 7

2) In details see Table 6.

Table 9: Existing and projected training facilities in documentation in Hungary

Serial No.	Specialists	Required qualification	Existing training facilities			Projected new training facilities		
			Institution	Duration	Character	Institution	Duration	character
	Documentalists							
1.	Leading staff of national & branch centres	H	ILS	1 year	Correspondence	TU. B. CTLDC	1 or 2 yrs. 2-6 months	Part-time day course Special in-training course
2.	Staff of national and branch centres	H	"	"	"	TU. B. CTLDC	1 year 2-6 months	Part-time day course Special in-training course
3.	Leading staff of local units	H	"	"	"	TU. B. CTLDC CIO BIO	1 year 2-6 months " "	Part-time day course Special in-training course " "
4.	Staff of local units	H, M	"	"	"	TU. B. CIO BIO	1 year 2-6 months "	Part-time day course Special in-training courses "
	Librarians							
5.	Leading staff of national & branch centres	H	ILS	5 yrs.	Day-course	-	-	-
6.	Staff of national & branch centres	H, M	In-training courses in central libraries and doc. centres	2, 5 years	"	-	-	-
7.	Leading staff of local units	H, M				-	-	-
8.	Staff of local units	M				-	-	-
	Other specialised staff							
9.	Abstractors	H	-	-	-	CTLDC	2-4 weeks	Special in-training courses
10.	Translators	H	-	-	-	Special institute CTLDC CIO	3-4 years 1-3 months 1-3 months	Full and part-time day courses Special in-training courses "
11.	Reprography officers	H, M	TU. B. THS	5 yrs. 3-4 yrs.	Day-course "	Extension of existing training courses to meet the special requirements of documentation		
12.	Reprography workers	M	THS	3-4yrs.	"		"	
13.	Others	H, M			.		"	
	Users of documentation services							
14.	University Students	L, M	TU. B. Faculty for Chemistry	2-3 weeks	Part of the study programme	All Science, Engineering & Economic Faculties of Universities	1-2 semester	Part of the study programme
15.	Scientists, engineers, economists etc.	L, M	Post-University Training Institute for Engineers	6-10 weeks	Evening course	Post-University Training Institute for Economists, Physicians etc. CIO BIO	6-10 weeks " "	Evening courses In-training courses "

Abbreviations

H = High

M = Medium

L = Low

ILS = Institute of Library Science of the University of Budapest

TU. B = Technical University of Budapest

THS = Technical High Schools

CTLDC = Central Technical Library and Documentation Centre

CIO = Central Information Offices of the Ministries

BIO = Branch Information Offices

Table 10: Projected Training Course in Documentation for Information Engineers (high level management and organisation).

1. Theory and practice of scientific and technical information.
2. Principles of management and organisation.
3. Organisation of documentation on national, branch and local level.
4. Sources of written information. Bibliography.
5. Fundamentals of special library techniques.
6. Processing of written information (indexing abstracting, reviewing, preparation of manuscripts, editing etc.).
7. Classification and indexing.
8. Translation. Technical linguistics. Foreign language practice.
9. Theory of information. Mechanical storage and retrieval of information. Mechanical translation. Mathematical linguistics. Mathematical programming.
10. Information and scientific research and development. Information as a decision making tool in modern management.

Table 11: Projected Training Course in Documentation for Information Engineers (medium level management and organisation).

1. Basic problems of scientific and technical information.
2. Principles of management and organisation.
3. Organisation of documentation on branch and local level.
4. Sources of written information. Bibliography.
5. Fundamentals of special library techniques.
6. Processing of written information. Theory and practice of literature searches.
7. Classification.
8. Translation. Technical linguistics. Foreign languages practice.
9. Practical reprography.
10. Information and scientific research and development. Information as a decision making tool in modern management.

Table 12: Documentation Course to be included into the programme of Technical University and similar educational institutions.

1. Meaning and importance of scientific and technical information. Information and scientific research and development. Organisation of documentation in Hungary and abroad.
2. Sources of written information. Types of documents. Problems of bibliographic control. Practical work with several types of general sources of information. Practical work in bibliography.
3. Specific sources of scientific and technical information. Annotation, indexing, abstracting, reviewing. (Differentiated according to the various fields of science and technology).
4. Elements of composing and preparation of manuscripts. Editing.
5. Present state and developmental trends in mechanical information. Practical reprography.

INDIAN SCIENCE ABSTRACTS*

A REVIEW

B R SESHACHAR

Dean, Faculty of Science
University of Delhi

At the recent 11th International Cell Biology Congress held in Providence, R. I. (U. S. A.) (August 30 - Sept. 5, 1964) the President, Prof. J. Benoit of France, outlined the problems and difficulties concerning scientific documentation and information. He said, there are in the world today 100, 000 scientific and technical journals being published, and estimated that at the rate they were growing, by 2000 A. D. there would be one million journals. He thought that it was impossible for the most active scientist to read even a fraction of the papers published in his special field and felt that soon, he would be unable to read even the abstracts. However, he emphasised the need of efficient abstracting journals which would carry to the working scientists, expeditiously the main trends of scientific advances.

That any one, as recently as ten years ago, anticipated the need of a scientific abstracting journal in India would have seemed strange, but the phenomenal advance of scientific research in the country and the spectacular proliferation of scientific publications by Indians and in Indian scientific journals have made the need of such a journal not only useful but imperative.

This need was felt some time ago when surveys by Insdoc revealed that the coverage of Indian documents in international abstracting periodicals was inadequate. In major abstracting services, like Biological Abstracts, Chemical Abstracts, and Physics Abstracts, hardly 50% of the Indian documents were covered, and the time lag was anything between 6 months to a year and a half. It is to fill this lacuna that Indian Science Abstracts is brought out. It is hoped, that besides serving as an effective bibliographical control of the Indian scientific literature, ISA will serve as a valuable feeder service to international abstracting services.

It is estimated that nearly 15, 000 scientific documents are published in India (or by Indians) every year in the form of articles, communications to scientific conferences and symposia, monographs, reports and other ad hoc publications, as well as patents, standards, and theses. The first issue of the ISA published in January this year notices 936 items, received in Insdoc during the month of October 1964. Since Indian periodicals are received in Insdoc within a week of their publication, the average time lag between the publication of an article and its noticing in the ISA could be taken as not more than 3 months which is a very good record. The time lag for articles published by Indian authors in foreign periodicals is at present 6 months.

Entries in the ISA are featured in a classified arrangement according to the Universal Decimal Classification system. For an abstracting service limited to a specific discipline of science the common practice is to feature the entries under broad group headings. But for a national service covering all branches of Science and Technology, a classified arrangement is considered more suitable.

Original articles including short communications, reviews and informative articles, are covered in the ISA. The nature of the articles is indicated in the ISA, after the bibliographical citation as per the 'Code of Good Practice for Scientific Publications' of the Unesco. This is a new feature.

It has been realised that a set of abstracts without adequate indexes has limited value. Science preparation of subject index is a time-consuming activity which calls for a good deal of intellectual involvement, most of the services so far were content with giving author index only. Of late, the technique of machine prepared index based on the keywords in the titles, has been perfected, and many of the premier services now include keyword indexes. Usually, these indexes are of either 'keyword without context', or 'keyword in context' type. But since keyword without the context does not indicate the scope of the articles and since keyword in the context of a group of words in its immediate proximity may not always give the exact scope of the document, keyword with context is claimed to be more effective. The keyword index given with each semi-monthly issue of the 'Chemical Abstracts' is an index of this type. The index prepared for the ISA is also of the keyword with context type.

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* Indian Science Abstracts (Monthly). Vol 1 N 1, January 1965. Published by Indian National Scientific Documentation Centre, Delhi-12. Annual Subscription: India - Rs. 50. 00; Foreign - $ 30. 00 (USA); £ 10 (Others).

The abstracting service of the type embodied by the ISA is a real need and it is gratifying that the INSDOC has at last provided it.

Statement about
"ANNALS OF LIBRARY SCIENCE AND DOCUMENTATION"
under Rule 8 of the Registration of Newspapers (Central) Rules 1956

1	Place of Publication	Insdoc, Hillside Road, Delhi 12
2	Periodicity of its publication	Quarterly
3	Printer's Name	S. Parthasarathy
	Nationality	Indian
	Address	Insdoc, Hillside Road, Delhi 12
4	Publisher's Name	S. Parthasarathy
	Nationality	Indian
	Address	Insdoc, Hillside Road, Delhi 12
5	Editor's Name	S. Parthasarathy
	Nationality	Indian
	Address	Insdoc, Hillside Road, Delhi 12
6	Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital.	Insdoc, Hillside Road, Delhi 12 (an organisation of the Council of Scientific and Industrial Research New Delhi)

I, S. Parthasarathy, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd. S. Parthasarathy
Signature of Publisher

Dated 31.3.1965

CURRENT DOCUMENTATION LITERATURE

CDL is an index to current periodical literature in Library Science, Documentation, Reprography and Translation. This index is mainly intended to serve the professional needs of librarians, documentalists and students. An attempt is made to minutely classify the articles. This experiment, we hope, will throw some light on the many problems of library classification and eventually lead to acceptable solutions.

This issue carries 561 entries of original and informative articles published currently in periodicals in the English, some of the other European, Japanese, and Indian languages totalling 61.. The number of periodicals covered in this issue is about 30% more than in the previous issue. It is the intention of the publisher to give a still wider coverage of periodicals.

The arrangement of entries is according to the Colon Classification ed 6, 1963, supplemented by the tentative depth schedules for classification, cataloguing and bibliography published earlier in the Annals, and for book science published recently in Library Science with a slant to Documentation. Slight changes have been made in the use of these schedules. An attempt has been made to give coextensive class numbers to the extent possible. It is proposed, however, to develop finally, elaborate schedules for this purpose, on the basis of our experience in the compilation of this list.

We earnestly hope this feature in the Annals will be received well by the subscribers. Any suggestions to improve the quality of the index will be very welcome and thankfully acknowledged.

Compiled by:

ARORA G K
GUHA B
KAMALA PADMAGIRISWARAN
RAJAN T N

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annals of library science and documentation

VOL 12 NO 1 MAR 1965

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Edited, printed and published by S. Parthasarathy at Insdoc, Hillside Road, Delhi 12.

UNIVERSITY

annals of library science and documentation

INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE DELHI - 12

VOL 12 NO 2 JUNE 1965

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Annals of Library Science and Documentation is published by INSDOC as a quarterly. The dates of publication are 31 March, 30 June, 30 September, and 31 December.

Annals of Library Science and Documentation is a Medium for publishing original contributions in the field of library classification, cataloguing, bibliographic organisation, documentation techniques, mechanical methods of documentation, bibliographic standardisation, etc.

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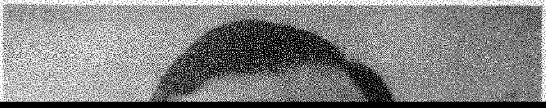
EDITORIAL



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at the same time on a practical and on an ideal level and the resolutions moved at the conference bear the impress of Dr. Rao's address.

Here are a few quotable quotes from his address:-

* Public Libraries are an indispensable condition for the utilisation of literacy and the intelligent participation by the people in the economic and political development of the country.

[redacted]

STRUCTURE, VALIDITY AND PROSPECTS OF CLASSIFICATION SCHEMES

A M ISAAC

Atomic Energy Establishment, Trombay,
Bombay-74.

Reviews the evolution and present state cf the discipline of classification and compares the principles and categories of various classification schemes. Brings out also the principles developed by the recent machine oriented IR methods and suggests that a wilful interaction between these two systems may endow the discipline of classification with a scientific rationale.Future schemes would be justified in basing its structure on 'concept'which is the smallest cognizable constituent element of knowledge. In this context the idea of the 'main class' which is the basis of all classification schemes has to be critically re-examined. Points out that if certain basic principles are accepted, the problem of construction of schedules will be reduced to a near-mechanical operation of enumeration and arrangement of relevant concepts.

1. INTRODUCTION

The basic concern of any information retrieval system is to organize information in a systematic and helpful order and facilitate the rapid recall at any time, however unanticipated it be, of any specific stored item or all items sharing a common characteristic. Classification systems, inspite of their intrinsic imperfections, inflexibility, and illogical and irrational emphasis, have to a remarkable degree succeeded, until recently, in meeting this requisite with special reference to the library situation and conventional book collections. However, "as library collections grew in magnitude and complexity, as unanticipated relationships emerged among disciplines, and as new disciplines were themselves evolved, the structure of traditional bibliothecal classification began to crumble until not only the structure itself, but the very idea of structure, was condemned" [S1]. This does not of course mean that the situation at present is hopeless and beyond repair. Human ingenuity always has a way of designing new systems to solve new and complex problems. This has resulted in a metamorphosis of the classification schemes, relegation of certain information retrieval functions to machines, efforts at analysing the basic parameters that should control the design of future schemes, a flux in the classificatory thought, and considerable increase in the quantum of literature on the subject. However, not infrequently the process lacked proper direction and purpose.

"A comprehensive search of the library and documentation literature substantiates the paucity of studies seeking to establish through comparative analysis the efficiency or superiority of one system of information storage and retrieval over the other " [K1]. Polemics have often ruled the scene and there has been an overemphasis on the relative role of classification in human communication. As has been succinctly put by Ralph Shaw in his 'brief appeal for sanity and hard work', "We have many articles describing classification schemes out of context in which they need to be applied, and without regard for the obvious fact that classification or indexing or coding, is just one step in the input (or output) routine, and that this, in turn, is simply one small step in the total cycle of storing and retrieving information. It has yet to be established that any given classification or coding scheme can provide anything that cannot be provided by other schemes, or that any mechanism, including the book, provides anything that cannot be provided by other mechanisms"[S2]. Some of the classificationists in their anxiety to evolve schemes that will last for all times and answer all possible situations failed to pay sufficient attention to the fact that in a field intensely practical as Documentation the validity of a system will be decided not always by the theoretical perfection, but by the operational efficiency. Cross-communication between different information processing systems was also almost non-existent. "Alphabetical indexing, classification and mechanical selection have been made to appear completely different techniques, and are described in such different terms that workers in one field are sometimes unintelligible to those in others" [K1]. Classification, if it should play its role fully, should adopt a more pragmatic approach and orient itself to the changing needs of knowledge and machine age. Controlled experiments on the pattern of the Cranfield Project aimed at an objective and intelligent measurement of the efficiency of various systems in relation to the needs and costs, informed and unbiased studies, like the one conducted by Eric de Grolier [de Gl] under the UNESCO sponsorship for the derivation of common elements and categories in the various classification and coding systems, and a wilful interaction between the fields of library classification and machine oriented IR methods will certainly open new vistas for the promotion of communication and human efforts.

In the following paragraphs besides an attempt to position the discipline of classification in relation to other subject areas will be presented a brief review, from the historic perspective, of the classification theory, an analysis of the structure, pattern and logic of classification, and a glimpse into the future lines of development.

1.2 Definition

"In its first sense [Grouping], classification means dividing the existents of the universe of discourse, concrete or conceptual, things or ideas, into different groups" [R1]. This virtually means an assortment on the basis of likeness and unlikeness. To Shera, the act of classification is inferential thinking as the mental process involved is one of inference. He wrote, "in the act of scientific classification or systematization, objects, phenomena, experiences, or concepts are pragmatically related to each other by means of certain "clues" or patterns of attributes" [S1]. Broadfield found in it "a demonstration of our ability to lift up a corner of the veil of secrecy hiding the order of nature". For generating optimum efficiency it is essential that a scheme of classification functions as a model of the existents of the universe in their entirety and there exists a one-to-one correspondence between the existents and the terms in the schedule, the value and position of each existent being maintained. Representation of terms in a filiatory or helpful sequence is necessary. It is to be admitted that our experience in the direction of building up a model has not so far been quite rewarding. All the currently existing classification schemes have failed to meet the requirements and they always lagged behind contemporary scientific thought and advance. The International Study Conference on Classification for Information Retrieval, Dorking, 1957, the first meeting (Feb. 1954) of the International Advisory Committee for Documentation and Terminology in the Pure and Applied Sciences (IACDocTerPAS), the Classification Research Group (CRG), London and a host of other study groups while emphasizing the need for a scientifically prepared universal classification explicitly stated that none of the existing schemes could be considered a priori and satisfactory for the arrangement of scientific documents. "What we are seeking is a structure capable of adaptation to the dynamic, everchanging continuum that is the field of knowledge as we now know it" [F1]. Ranganathan has also expatiated on this theme repeatedly in his writings: "The universe of knowledge is a dynamic continuum, which is everincreasing in its turbulence" [R2] [R3]. According to the Kantian School of Transcendental Philosophy, our knowledge of the universe is not absolute; it is virtual. Our understanding of entities will be influenced by the totality of our knowledge. We do not classify objective reality, but only our understanding of it. With the advancement of science new knowledge will be generated and it will, in turn, widen our mental horizon. We perceive new depths, and new relationships between subjects demanding the adaptation of the classification scheme. It follows that the ideal classification scheme should be infinitely hospitable, so as to accommodate in a coherent and helpful way these continuing changes.

2 STURCTURE, PATTERN AND LOGIC

An artificial line of demarcation was being drawn between philosophic and bibliographic classifications until recently. Bliss found this distinction illogical and untenable. Through his eminent treatise 'Organization of knowledge in libraries and the subject approach to books (1939)' he elaborated his view point with extreme clarity which won general approbation. He contended that "when books and documents are classified by their subject-matter or contents, regarded as knowledge, or as sources of knowledge, those classifications are virtually classifications of knowledge" [B2].

2.1 An Approximate Model

As analogue to the universe of knowledge which is a 'dynamic continuum' let us take a sphere made up of innumerable globules (quanta), each globule being vested with the freedom to move within the sphere to any position and make its own combination either with an individual globule or with a group of them. Let us further assume that any single globule may simultaneously belong to different sets and it is possible for a set of globules to form into a bigger globule.

2.2 Concept, Language and Logic

Each globule could now be considered as representing the basic or elemental functional unit of knowledge, a 'concept'. An age which has seen a veritable 'explosion' in the number of 'elementary' particles that constitutes matter should reasonably anticipate a later fragmentation of the thought unit 'concept'. Each concept will have its own individualistic value and content which will vary according to situations and area of combinations. However, 'concept' being the smallest cognizable constituent element of knowledge, we would be justified in basing the structure of classification on it. A 'concept' is not as transient and unstable as a compound subject. Its function in the thought process is analogous, although in an imperfect manner, to that of a brick in a mammoth structure under construction. According to Shera, "concepts are the stuff of which patterning, i.e. classification, is made .... In short, a concept is a network or pattern of inferences, associations, and relationships which are predicated, or otherwise brought into play through the act of characterization. Within the framework of a theory of thinking, concepts and the processes of concept-formation appear not as independent entities, but as aspects of the thought process. Concept formation then, is not a separate and independent function of the mind, which operates autonomously and is directed by its own rules on the higher levels of thought integration. It is intimately linked with memory-organization, anticipation, cognition, and other mental processes and functions" [S1].

A "concept" is an abstract entity and is intangible except through the medium of its symbol, word or words. Variables such as imprecision and inadequacies of language, infinite scope for false interpretation, and mutations consequent upon common usage take the subject of classification to grips with the following semantic problems: 1. not all concepts have their equivalents in natural language; 2. the same word occasionally stands for more than one concept (homograph and homonym); 3. certain concepts could be represented by more than one word (synonym); 4. usage has limited, distorted and depleted the content and meaning of certain concepts in the process of representation in natural language. The relationship between the words and their meaning (semantics) is a variant because language, like knowledge, is a dynamic entity which is being influenced considerably by the march of time. A label assigned to a concept at one point in time might later prove to be inappropriate, imprecise and inadequate; and 5. words representing a body of concepts do not always embrace the value of all the constituent concepts.

These semantic factors are to be taken into account when any structural detail is worked out connected with the design, adaptation or servicing of a classification scheme.

2.3 Concept Co-ordination and Patterning

Classification is essentially a process of patterning of concepts, i.e. representation of concepts in ways permitting the display of their natural, but manifold relationships. All schemes of classifications, and manual and mechanical indexing systems are oriented to this end. While the "tree of porphyry" type of classifications started with arbitrary main classes and proceeded by a process of dichotomous division and arrived ultimately at the basic unit 'concept', the recent faceted schemes and alphabetical indexing methods reversed the order and commenced from the lowest rung (concept), made provisions for co-ordinating and subordinating concepts based on their natural affinities and relationships and gradually drew up a synoptic map of the universe of knowledge. The latter approach is more in lines with the current pursuit of problems where researchers normally base their studies on specific topics and areas instead of studying broad fields of knowledge in their entirety.

The problem of concept patterning primarily vests with the difficulty in analysing and arriving at the general categories under which concepts should be grouped, in determining the precise relationships between individual concepts, and assigning suitable notations and indicators for the concepts and relations. Classificatory language, like natural language, needs a systematic grammar and rules for syntax and until we succeed in grappling with the problem, our approaches will bear only partial validity.

2.4 Content Analysis and the Problem of Consistency

Subject classification until recently had to play an extremely limited role; however, it is now well recognised that "classifications based solely on the labels of the information carrier, the heading of chapters, the titles of papers or reports, will not take us very far" [F1]. An information store, if it should meet the needs of the times, should have pre-determined approaches to every view point of potential importance. Consequently, the depth analysis of the content of each document has become imperative in both mechanized and non-mechanized methods. Increasing intricacies of subjects and emergence of complex relationships between them have made this particular step rather difficult. "At best, content analysis, as a human process, is subject to a wide range of interpretations because of individual differences in the education, experience, and psychological orientation of the indexers" [B3]. The basic problems and principles of subject analysis are essentially the same in all systems and they do not vary according to the mechanics of retrieval. The reliability and efficiency of any information system will be decided by the consistency, exhaustiveness and depth of analysis of subjects before the documents are being put in the store. Content analysis could very well be said as the heart of the problem of information processing, and it is certainly an intellectual operation. It is essentially an intuitive process and certain value judgements are to be made when deciding the aspects of subjects treated in a document.

"Common experience suggests, and experiment confirms, that a person does not always make the same choice when faced with the same options, even when the circumstances of choice seem in all relevant respects to be the same" [D1]. The experience of the Classification Research Group, London, in this direction is worth quoting. The members of the Group, in spite of their rich background, could arrive at consistency in the notation only when the subject of documents were generally agreed upon and explicitly stated. Even in a field familiar to all the members, it was generally difficult to arrive at a consensus regarding subject content of the document. Certain studies made at the Western Reserve University, which maintains a mechanized information system, also confirmed the view that consistency is almost impossible in practice. The same operator when analysing the same reference question into constituent units at different times gave entirely different results. It is one of the operations where complete mechanization has not so far been achieved and there is considerable evidence to believe that it will continue to remain as a manual process for many more years. It was found that application of the computer in this field is considerably expensive and in the current state of development of machines there is no likelihood for any immediate break-through. The U. S. Patent Office in their attempts at mechanization felt that the process of content analysis should be relegated for quite some time to humans only. However, statistical and syntactical studies are being currently conducted with the help of computer to assess the possibility of gradually mechanizing this step. Kent feels that "absolute consistency may be achieved only if machines are used to scan the complete text of natural languages and to perform analytical decisions based on instructions (programs) developed by human being" [K2]. However, no machine has been developed, to-date, which is able to read any text in any type font and until such development materialises machines cannot take over this activity. There is need for further studies for developing rules for extracting constituent concepts from a document so that there will be certain guide lines for effecting consistency in the process of content analysis.

3 EVOLUTION OF CLASSIFICATORY THOUGHT

3.1 Enumerative and Semi-Enumerative Classification Schemes

Library classification has as its basis Aristotelian logic and Baconian empiricism. The body of rules which governed the principles of subject division was primarily drawn from the principles of Aristotle and the process of actual enumeration of terms depended heavily on the methods heralded by Bacon.

Every classification scheme is essentially enumerative in nature, i. e. numbers are assigned for subjects and enumerated in the schedule. However, in conformity with convention, let us use the term 'enumerative' in a restrictive sense to represent schemes in which specific subjects are given notational representation and arranged in a single, preconceived, hierarchical order. Schemes with built-in provision for the flexibility of combination of concepts, scheduled in different compartments based on a sequence of common attributes will be called 'non-enumerative' or 'faceted'. Infinity of variations could exist between these farther ends.

An enumerative classification has a monolithic structure and attempts to represent the multi-dimensional knowledge specifications in a linear or uni-dimensional space. Such schemes are patterned on the Aristotelian principle of dichotomous division of classes of genera or greater extension into species or areas of narrower extension, and sub-species and so on until the ultimate and specific classes are reached. (How far a specific subject is ultimate is a moot point). Each step of division based on the classical five predicables (genus, species, difference, property and accidents) produces by a process of differentiation class A and its negation or complementary class A'. The possession or non-possession of a postulated characteristic will be the prime factor determining the process of division. This type of classification rests on the assumption that division of subjects resulting in exhaustive and mutually exclusive categories is possible.

All schemes of general classification with the sole exception of Colon Classification (1933) and most of the special classsification schemes fall in the enumerative or 'pigeonhole' type. The Decimal Classification (1876) of Melvil Dewey rightly takes the place as the first systematic scheme of library classification, founded on scientific principle, and inspite of logical imperfections continues to be used in libraries on a large scale. One could see that even in this scheme the principle of dichotomous division has been followed only in an imperfect and inconsistent way. The Library of Congress scheme (1902-1920), although is being used widely in a number of American libraries on account of special accidental reasons, has not much to offer towards a coherent theory of classification, except that this is a scheme framed with the active participation of subject specialists. It was specially oriented towards the actual needs of a large initial book collection and has made provision for revising it and keeping it up-to-date by professionally skilled persons. J. D. Brown's 'Subject Classification'(1906) is also weak in structure and has almost become outdated and out of use. The 'Bibliographic Classification' (1935) of H. E. Bliss could be seen as a revolt against the logical imperfections and lack of flexibility of the previous classification schemes. He found that the Aristotelian logic alone is inadequate for classification purposes. He has after a deep study of the theoretical foundations of all classification schemes decided to employ in his scheme the principles of comprehensiveness of all knowledge, subordination indicated by the gradation by speciality (general to specific), co-ordination shown in collocation of related subject fields, and composite specification (one aspect of knowledge could reappear in different forms in the same or different subject areas) and made provision for alternate location of subjects. This scheme in spite of its rich theoretical content suffers from the weaknesses and inhibitions of other enumerative schemes and is incapable of representing the complex relationship between multiple concepts.

On account of the rapid scientific advancement and increasing subject specialization a rigid scheme like the D. C. almost became inadequate. The need for more depth subject specification became manifest and in answer to this challenge Universal Decimal Classification came into being in 1905. This scheme with its special analytical numbers, auxiliary tables, and signs of relation was a bold experiment in classification design in that it provided provision for the combination of concepts enumerated in different places (although in a limited way) and numerical representation of subjects of greater intensity. In U. D. C. "every compound subject would therefore have a unique code number... Partially ordered systems like this are called 'lattices' because their order is the same as the relations between the points in a lattice. The main feature is that only two members have a least upper bound that contains all entities in either or both of them, and a greater lower bound that contains all entities that are in common to both of them ... In technical terms, the U. D. C. is symmetric, commutative and associative only by means of multi-localism; in ordinary language, by multiplying cross references" [F2]. However, as most of the special features were only transplanted to the basic frame of a rigid enumerical scheme (D. C.), it failed to escape the inhibitions inherent in the parent scheme and succeeded only partially in discharging the anticipated functions when the scheme was originally designed by Paul Oltet and Henri La Fontaine. This semi-enumerative scheme continues to be the widely applied classification system for scientific documentation purposes and investigations are being currently conducted to assess its adaptability for machine literature searching.

The propriety of expecting complementary classes of equal importance at each stage of division and reliance only on the genus-species relationship are subject to much criticism. Conventional classification schemes and most of the present day information systems have, however, taken for granted the existence of complementary classes and relation of inclusion and for mathematical interpretation based largely on the logic of Boolean algebra. Fairthorne comments that "Bibliographic classifications have no unique complement, and are therefore lattice systerms" [F3]. In an enumerative classification scheme, subjects will be scheduled with corresponding notations and so one should anticipate it to be simple for practical application. Practice is at variance with it on account of the difficulties associated with the linear representation of complex view points. According to Ranganathan "the complicated structure of micro-thought of deep intension needs a class number with an equally complicated structure. The perfect simplicity of an enumerative scheme is akin to the vacant smile of idiocy described in the Good earth of Pearl Buck. Abstract classification tells us that a scheme is not worth adoption if it cannot yield with equal ease and certitude a simple class number for huge and simple macro-thought and general book, and an expressive, coextensive, though complicated, class number for tiny complex microthought and specialised article [R2].

3.2 Faceted Classification

The publication in 1933 of the first edition of Colon Classification of S. R. Ranganathan stands out as a landmark in the evolution of classificatory thought. Faceted or analytico-synthetic principle was propounded as a practical means for the notational representation of subjects with multiple facets and relations in a coherent and helpful order. It consists essentially in breaking down the elements (concepts) in a postulated field of knowledge into homogeneous, mutually exclusive sets (facets), the elements in each set possessing a common attribute or characteristic, and provision for co-ordinating the elements from the same set or different sets according to a pre-determined pattern. Enumeration is restricted in the schedule to terms under each facet. The process of actual classification involves the analysis of the subject content of a document into constituent concepts, identification of the relevant terms in the schedule, and synthesis of them according to the combinatorial rules which are laid down in the scheule, i. e. it consists of the following stages: (1) content analysis into constituent concepts; (2) matching and identifying each concept from different facets; (3) representation of them into the natural language and filling up the ellipses; (4) arranging the terms according to a predetermined order (Arrangement in CC is on the basis of an elusive characteristic the degree of concreteness of categories); (5) translation of the terms into notation; (6) assignment of the necessary connecting symbols. Ranganathan emphasised that "facets are not qualities of class numbers alone; nor are they peculiar to the scheme of classification used. On the contrary, facets inhere in the subjects themselves, whether we sense them or not. Subjects will be helpfully featured, and their arrangement will be made filiatory and helpful within any scheme of classification if such a scheme is based upon facet analysis, and if the class numbers reflect the facets properly. Particularly will this be so if the method of building class numbers admits of each facet being kept intact, and of its focus being sharpened to any desired degree, as is the case in the Colon Classification" [R4].

There is reason to believe that the 'facet principle' was in existence in a slightly variant form in certain other disciplines. But the credit for forging it as a powerful tool in the armoury of library and information systems certainly goes to Ranganathan. It has to be mentioned that Gérard Cordonnier also, almost independently, developed a classification theory which invoked the facet principle. A number of specialized classification schemes based on the facet concept has been evolved during the last few years. Special mention should be made of the remarkable work done by the members of the CRG, London, the principal among them being Vickery, Foskett, Barbara Kyle and Coates. These schemes represent either refinements or adaptations of the methods made explicit by Ranganathan and are limited to specific subject areas. However, there is wide variance in the methods employed by each of them. It is now generally agreed that only a faceted scheme will be able to answer the needs of science and technology and the current line of research in the classification field is governed by this assumption. The Dorking Conference (1957) has categorically emphasised this point. CRG, London, which feels that sufficient theoretical understanding has been reached for constructing a universal scheme of classification is convinced that such a scheme should be designed on the faceted principle. However, they have failed to spell out the lines for the design of such an ambitious scheme. Besides, there is evidence of considerable disagreement within the Group on the basic plan and pattern.

Faceted classifications, although in theory were evolved to represent the inexorable subject relationships, have been successful in practice in showing only a specific sequence of relationship among the many possible ones. The resultant number, when constructed according to the facet formula (specified order or categories), is linear and hierarchical and assigns importance and priority (in the matter of notational placement) to the concept falling in the first category and subordinates concepts drawn from the secondary, tertiary, etc. categories. There will be an ultimate scatter of material bearing on concepts which do not fall in the 'first category'. Adoption of chain indexing to faceted schemes partially overcomes this defect. The co-ordinate indexing and punch card methods are free from this drawback as they enjoy greater combinatorial versatility and permit synthesis in any preferred order.

3.3 Postulational Approach

A set of explicitly stated postulates was enunciated and incorporated in the 4th edition of Colon Classification (1952). The Dorking Conference (1957) recognized the need for a postulational approach in connection with the design of any classification scheme. Any system of symbolism should be based on a set of hypotheses or normative principles. Adoption of certain postulates or a priori truths is necessary to derive the maximal use of our sense experiences and the rapid unravelling of empirical truths. Formulation of these normative principles is guided more by intuition and logical inference of the ingrained unconscious, and there is no way of verifying them physically by direct approach to the senses. However, for the success of any theory based on these postulates it is necessary that they be valid, pre-determined and immutable.

Ranganathan, with reference to the postulational method in classification, has remarked: "The experiments show that the mere fact of a scheme being faceted or not does not go the whole way in determining the invariant-complex to be preserved. It is felt that the desirable invariant-complex cannot be seized with out present methodology and mode of thinking by searching for them in the phenomenal, surface level of the universe of knowledge. At this level, the invariant-complex appears to play will-o-the-wisp. To escape its tantalisation a break through the phenomenal surface level has been made and a dive taken towards the noumenal seminal level" [R3].

A distinction is being unnecessarily made out in recent times between 'faceted' and 'analytico-synthetic' schemes in the following way: faceted scheme + explicitly stated guiding postulates and principles = analytico-synthetic scheme. Recognizing (1) design of any faceted scheme of classification is a scientific process, and (2) postulational approach is the sine qua non of any scientific theory or process, we are justified in inferring that the design and development of every faceted scheme will be controlled by a body of postulates and principles or that the two terms 'faceted' and 'analytico-synthetic' are synonymous when used in connection with classification.

Ranganathan in his attempts at constructing a self-perpetuating, consistent, analytico-synthetic classification has evolved a metaphysical rationale which starts with the total universe of knowledge. He postulated the existence of certain basic classes and that each facet of any subject could be considered as the manifestation of one and only one of the five fundamental categories, Personality, Matter, Energy, Space and Time (PMEST).

3.4 Main Classes

All the general schemes of classification so far formulated have as their basis on arbitrary, ineffable entity, the 'Main Class'. No classification theorist has ever ventured to define formally this entity except by enumeration. How can one delineate precisely the bounds of an entity when the entity itself is a changing one with bounds now shrinking, now expanding, and always remaining in a state of flux? It is highly illogical to base a classification scheme on such an ineffable, fluxional unit of knowledge. A study of the various editions of CC will show that the number of main classes has steadily increased over the years. More and more canonical classes are attaining the status of main classes by force of literary warrant. This would have been the case in every classification scheme but for the inflexibility and inhibition of the notation.

In ultimate analysis we find that in spite of the provision for phase analysis and seminal mnemonics, the categorical framework built up by Ranganathan rests on the assumption that any specific subject is formed by the interaction of the postulated five 'fundamental categories (PMEST), the operation being confined to the bounds of a 'main class'. The propositions palmed upon us are difficult to be accepted as they are since it would not be prudent to expect a basic law of nature to start operation only wihcin an artificial compartment of knowledge, the 'main class'. We are prone to ask the question, "How happens it that a firm superstructure has been erected upon an unstable foundation?" [M1], which John Stuart Mill asked when he felt disappointment at the fragility of the first principles that formed the basis of all logical systems. Want of solidity in the premises will certainly prejudice the validity of results. So, in an ideal classification structure the basis laws of nature should operate throughout in consistent manner, without being bogged down to an artificial compartment. It follows that when the classificatory thought attains maturity the 'main class' will ultimately 'wither away A number of questions immediately come up for further investigation, primarily because in spite of the illogical basis the concept of main class helped to meet exigencies and provided a number of practical conveniences. Besides, the line of demarcation between classification and indexing systems will become thin if the 'main class' is dropped. The theory of integrative levels, currently being studied by CRG, London, will be of immense value in this context. Barbara Kyle in the design of a classification scheme for social sciences refused to base the system on conventional main subjects like Politics, Economics, Law etc. The general categories 'activities' and 'personalities' operate throughout the subject area, chosen by her based on the point of view of the user. There is certainly a need for an objective, detailed, re-examination of the concept of 'main class'.

3.5 General Categories

The word 'category' has been differently understood and defined:

"Concepts of a high degree of generality with a wide area of application elaborated by the mind in referring directly or indirectly to empirical knowledge and utilized by the mind in interpreting such knowledge" - Vickery [V1].

"A comprehensive class or description into which items of knowledge or associated documents can be grouped" - Taylor [T1].

These definitions are not precise enough to represent fully the picture of 'category' which we have in our subconscious level. For example, Taylor's definition of category could very well be a definition of 'main class' and as the two are different the definition is apparently weak.

A systematic classification should provide a continuous mapping of the universe of knowledge. It should function as a framework into which the various constituent units of knowledge could be fitted in the order in which they exist in nature. The laws of nature are highly concealed and only precariously established and so it is not easy to derive the sequence of common features or attributes on the basis of which broad groups or sets of concepts could be generated. The perception of categories varies according to the subject areas covered and the mental approach of the classificationist. Ranganathan believes that the same general categories (PMEST) operate in all fields of knowledge and in that sense they may be termed 'fundamental'. However, there is no posteriori justification confirming the validity of this assumption. Other theorists in the field found the inadequacy of relying exclusively on the categories made explicit by Ranganathan.

The need for more general categories was found especially in the field of science (pure and applied). "Ranganathan has several times described the fundamental categories, in Colon Classification itself, in Prolegomena, in Philosophy of library classification, but he has never really succeeded in putting them on an objective basis. So far, the CRG has not offered anything to replace the PMEST formula, and has remained content with a pragmatic approach, identifying facets by reference to the literature itself of any subject to be classified. This does not detract from the great power of the method, which appears to be the best so far for obtaining the main desiderata of systematic listing of terms, flexibility of combination, and avoidance of ambiguities and alternatives that produce inconsistencies in classifying and a consequent separating of documents dealing with the same subjects" [F1]. The assumption of the existence of a few fundamental categories has great practical value as it provides a convenient matrix for effecting facet analysis. How far these categories are fundamental, actual, and identifiable is, however, not easy to decide. Ranganathan admits the manifestation of [M] category only rarely. Again his category [P] is an ineffable or indefinable entity which could be identified only by the method of residues, i. e. anything that is left over after the removal of all [T], [S], [E] and [M].

If facet analysis should prove of value it is necessary that the categories be easily recognizable. They should besides being consistently valid be of general application in the subject area chosen. Eric de Grolier although has not succeeded in deriving the general categories present in all the existing classification and coding systems was able to display the variety of categories accepted as valid by different schools. General categories that could be found in some of the important systems, selected at random, are listed in Table 1.

A perusal of categories used in various systems will convince that the function of such a concept in classification has not been fully understood by all. In certain systems they are used so loosely that one finds it difficult to draw distinction between those 'categories' and the conventional subject divisions of the early hierarchical schemes. There is need to carry out further studies to ascertain if a few general categories are applicable in all subject fields. For obtaining valid empirical results, it is necessary to vary the categories and test in different subject areas. We should also study if efflux of time changes the categories and 'quasi-isolates' present in postulated subject areas. Categories should be considered only as attributes that permeate throughout a postulated subject area and bring about a categorical framework into which concepts fit in their natural order.

3.6 Role Indicators, Connecting Symbols, or Operators

The syntax of the classificatory language is effected by the sequence of facets, distinctive symbols or a combination of both. To avoid redundancy, non-pertinency and inaccuracy in the co-ordination of concepts and later retrieval of specific items, it is necessary to have few, nonambiguous role indicators (variously called connecting symbols, association links or operators) which are capable of retaining the contextual meaning of the concepts and specify their relationships. The function of these symbols is to differentiate and indicate both analytical and syntactical relationships between concepts.

The number of connecting symbols required will be limited in a purely enumerative scheme as the problem of synthesising concepts extracted from different parts of the schedule does not arise frequently. The need for these symbols will be slightly more in a semi-enumerative scheme like U.D.C. as certain analytical relations are to be represented. In the case of a faceted scheme of classification of the pattern of C. C. there should be provision for specifying both intra-facet and intra-phase relationships. Special mention should be made here of Foskett's London Education Classification in which he has made facet indicators redundant by using a constant three-letter pronounceable 'syllable' for every term. The method has yielded only partial success confirming the continued validity and need of role indicators. In alphabetical indexing systems and mechanized IR systems the number of such symbols should be infinitely more to compensate for the semantic factors and the syntactical problems. The role indicator assumes a slightly different role in the context of such systems and will function also as a "symbol added to an index term to indicate that the term is used as the name of, say, a product, a process, a device, etc" [I1]. It will help considerably to reduce noise or cross-talk in the system. It is necessary to specify by distinctive symbols both syntactical and analytical relationships. A few of the relational symbols used in various systems are represented in Table 2.

4 SYMBIOSIS OF MANUAL AND MECHANICAL SYSTEMS

4.1 Coding, Classification and the Thesaurus Approach

Any system of communication requires a set of symbols or codes for the representation of concepts and notions in their manifold relationships. In its generic sense the word 'code' is a synonym for any symbolic language and covers every classification systems and even the natural language in its ambit. However, the term has assumed a restrictive value in conventional usage and cannotes symbols or characters written in machine readable form. This is effected by the use of abbreviations or the assignment or arbitrary symbols or positions. Taylor has defined a code as "any system of symbols in the communication process, particularly a system which achieves abbreviation, consistency of expression, ease of representation or some other desirable advantages over common language or numerical expression" [T1]. There are different types of coding in vogue, the principal among them being number and letter coding, field coding and pattern coding.

At the interface of coding and classification are a number of common characteristics (and a few functional differences). Coding in the context of IR demands the assignment of pre-determined symbols to every individual concept ingrained in the document. An aspect which is not specifically coded cannot be later retrieved. Coding should be exhaustive, consistent and to specific entities. All the concepts to be represented are to be anticipated and scheduled in a helpful order; in other words, there should be a dictionary of 'key-words' or 'descriptors' which specifies and controls the terms and codes to be used. Synonymous and near-synonymous words should be indicated. It is even necessary, in certain cases, to display the analytical relationships between terms and association of notions. Such a dictionary, Thesaurus, which is an authority file for practical coding, has a number of features common to classification systems.

In coding, the mark assigned to a term does not normally represent the place and position of the term in relation to other terms in the postulated subject area and so the notation is normally brief and simple. Some of the marks, such as the binary symbolism, used in coding can be easily recognized only by machines and so validity is restricted to machine-oriented systems.

There will be considerable wastage of notation if the subject-expressive classification symbolism is substituted in place of conventional codes. Classification numbers vary widely in length, and the size of the fixed field required for representing them will be the length of the longest expected classification number. The problem is considerable if multiple concepts are to be represented in the notational level by means of association links. Besides, there will be difference in the filing order of classification scheme and the sorting and collating sequence of the processing equipment. The Atomic Engery Research Establishment, Harwell, where punched-card indexing was tried in conjunction with the U. D. C. had to abandon it after two years as the system was found to lack in efficiency. Brisch [B4] has admitted in as early as 1948 that U. D. C. form of notation is not suitable for mechanical sorting. However, with the development of the computers with large memories and stored program control the problem has been considerably reduced in size. A notation of the length of a conventional classification does not pose any problem from the technical point of view. Yet the adoption of such complex notation is warranted only if some positive results are assured. "Direct mechanization of traditional library classifications is like building locomotives to run with legs" [F4]. Classification schemes for being oriented to the machine systems need considerable adaptation. According to Ranganathan "a system of organic, expressive symbols which is best suited for this is believed to be provided by a classification system of an anlytico-synthetic kind- which amounts virtually to an artificial language of ordinal numbers, such as those used for arranging the recorded materials themselves in a helpful filiatory order" [R5].

The interchangeability of coding and classification symbolism is bound up with a number of practical limitations. The currently established coding systems are weak in displaying generic and group relations. Although generic or hierarchical relationship is not the only approach in the concept co-ordination process, it is yet valid and natural and so a scheme which does not make provision for such an aspect is essentially weak in structure and fails to provide exhaustive coverage of material on any subject area. In the Semantic Code (Perry and Kent) of the Western Reserve University an attempt was made to combine the advantages of conventional coding systems and hierarchical classification schemes. The resultant scheme was considerably complex, although facilitated to a certain extent generic searches. However, the efficiency of the system was considerably lower on account of a variety of factors. It is necessary that altogether different approaches are made to get a gradual symbiosis of these two operations. In the context of inter-lingual translation the concept of developing a meta-language has gained a near acceptance. The propriety of using classification as a meta code in conjunction with conventional coding should be examined. This implies assigning both the code number and classification number to each descriptor term, the function of the latter number being to display the inter-relationship of subjects.

The methodology of work would be to derive the key words from the postulated classification scheme. In other words, the main section of the key word dictionary will be an alphabetical index to the relevant terms of the classification schedule. However, each key word will be tagged on to both classification and coding symbols. New key words should first be assigned a place in the classification schedule before being added to the dictionary.

Study should also be conducted of reducing the classification symbols for direct application as codes. The current difficulties in employing classification numbers for data processing systems rest primarily on the structural inhibitions of the notation. If these numbers could be reduced to machine readable patterns, it might be possible to gain all the advantages of conventional coding and classification. In all mechanical systems the time for retrieval is directly proportional to the area of search and the use of classification will help to reduce the search area considerably.

4. 2 Computer Generation of Key Words

Index terms are either 'derived' or 'assigned'. In the former the terms are derived from the relevant documents based on statistical analysis and word matching techniques. KWIC indexes fall in this category. This method ensures literary warrant. In the latter method, terms are selected from a pre-compiled classification schedule or key-word dictionary. From the point of view of standardization and consistency this method has value. A combination of the advantages of the 'derived' and 'assigned' indexing systems could be obtained by the employment of a computer and a symbiosis of classification and coding. A computer could be programmed to derive terms automatically from documents pertaining to a postulated subject area and the terms could be used as isolates for building up a classification schedule and later a key word dictionary. The terms function as assigned index terms in later operations.

4. 3 Matrix Methods and the Node Representation

Conventional methods of classification although capable of meeting the requirements of small and medium sized libraries and book collections have been found to be inadequate to meet the complex problems associated with the handling of multidimensional and many faceted scientific knowledge contained in documents. Verstaile abstract systems will have to be designed with the help of advanced mathematical methods. This is especially true in the case of systems in which computer is employed for the processing of data.

The functional unit of knowledge, concept, was represented as an element in a set (facet). The approach selected should be versatile enough to accommodate all the possible manipulation and re-ordering of these elements by means of certain symbols which could be used as input material. In such a system, it is necessary to optimise approaches to the different diffused bits of information contained in documents. Codes or classification schemes which logically stand for the various representations of information could be generated. By effecting sophistications in the codes, it is possible to construct simpler logical structures which sanction high reliability (even in the presence of noise). Scientific information could be deemed as a complex of structures or net works made up of concepts. Matrix algebra is being currently used for all theoretical work in physical sciences and engineering and is a powerful tool in the manipulation of symbols. It will certainly find application even in the classification theory. Logical matrix could be used also as an auxiliary means for the design of codes. This approach, besides specifying the arithmetical operations to be performed by the computer enables automatic handling of the data. Most of the computers are provided with large program libraries on magnetic tapes for matrix algebra and so they can, without pre-programming, handle problems in the matrix form. "Theoretically, the model of the built-up system is supposed to be constructed from a set of parts which are interconnected in a set of nodes. The properties of the system then are to be found for known properties of the elements and of their connection of nodes" [L1]. Node representation could be extremely useful in the mechanised system of information retrieval. However, considerable thought is to be given to ascertain the parts of information that could be deemed as a node. It is likely that node can be a substitute for the role indicators. However, any final decision in this matter should be based on empirical results and experimentation. It is known that in the current development of computers, they are not capable of recognising diagrams that represent a structure or network. In such cases it is possible to reduce them to the form of simple incidence matrices with elemental values 0, 1 or -1 which the computers could easily read. Even in manual and semi-automatic systems the matrix method is of value. In the French Atomic Energy Commission's classification scheme (reported in CEA-568) a bidimensional approach is employed. The notation is a square matrix of 25 elements defined by 5 rows and 5 columns, the rows corresponding to the different scientific and technical approaches and the columns the different research areas in CEA. They are indicated below:

Rows

Theoretical problems

Production of phenomena
Measurement of phenomena
Description of phenomena
Utilization of phenomena

Columns

Inter-scale phenomena, communications, physics of the field
Corpuscular scale
Nuclear scale
Atomic and molecular scale
Macroscopical scale.

The notation bears the following form

$$\begin{matrix} A & B & C & D & E \\ F & G & H & J & K \\ L & M & N & O & P \\ Q & R & S & T & U \\ V & W & X & Y & Z \end{matrix}$$

In our attempts to get a symbiosis of coding and classification systems, the use of matrix methods should be studied in greater detail. As the matrix algebra is broadly based on few elementary axioms, theories based on it will find wide application in different contexts. Factor analysis which is concerned with the internal structure of matrices of covariances and correlations has been suggested in recent times as an effective mathematico-statistical tool both for the derivation of classification categories from documents and the automatic assignment of classification notations to documents. This method helps to reduce the data represented in the matrix form to a small number of easily recognizable hypothetical variates or factors (eigen vectors) which together will approximately account for the total variance. Logical matrix and node representation, if given a purposive place in the theory of information handling, will contribute considerably to the efficiency of systems. The relative roles of Boolean algebra, lattice theory, and other topological notions in different operations associated with information processing, especially in classification and coding, should be assessed.

4.4 Guide Lines for the Design of Future Systems

The contributions of CRG, London, FID/CA committee, Ranganathan and associates, and innumerable other bodies have given a new dimension and pruposiveness to classification theory. The lines on which future classification systems should be based have to a certain extent become explicit. No single classification system is likely to meet the varied requirements of all libraries/ information centres. It would be neither economic nor prudent to concentrate efforts on designing an 'all do' classification scheme. However, it is likely that certain basic principles in the design will have applicability in a number of areas. The problem of construction of schedules will be reduced to a near-mechanical operation of enumeration and arrangement of relevant concepts. Classification numbers will before long cease to be 'call numbers' in library operation. Corresponding to an increase in the complex nature of subjects, the notation also will become lengthy making them unwieldy and inconvenient for practical handling. The relatively simple work of identifying and locating individual documents will be done by another set of simple numbers such as serial numbers or notation derived from classification numbers by a process of reduction. The primary function of classification symbolism will be restricted to the grouping of subjects in a filiatory order and the display of multiple relationships of concepts.

The facet principle will become the sine qua non of all rational classification schemes and a set of derived empirical laws or assigned postulates will govern the construction of different schemes. In the design of classification schemes, 'concept' will be taken as the basic functional unit and starting point and increased number of role indicators will be employed for purpose of precision. There will be an increased use of the various types of bidimensional symbolisms in classification and coding operations.

Descriptor lists and thesauruses will contribute towards new approaches in the shape of schemes and mode of representation of relations. An examination of the Euratom Thesaurus [E1] will clarify this point. It contains besides 1,230 general purpose keywords, 1,836 keywords representing inorganic compounds and 1,404 nuclide designations a glossary of over 2,000 non keywords (not to be used) along with cross references to terms that should be used instead. All these terms are arranged in the alphabetical order. The keywords are split into 42 groups, each group containing related concepts. The divisions have been effected based on the research and development areas in Euratom. The hierarchical and associative relations between the keywords falling under each group are vividly displayed by means of bidimensional, expressive charts. The "graphic display shceme" for 'Nuclear Physics' is reproduced as Chart 1. Arrows (and not cross-referencing) are used to indicate relationships between terms within the group and to terms falling in other groups. The direction of the arrows is normally from the higher to lower generic level. Co-ordinate relations are represented by two-way arrows. The descriptor list of the Gmelin Institut [Gl] has a slightly different approach for the display of subject affiliations. The basic classification shheme for coolant (collant materials and physical state) is reproduced as Chart 2. The original chart is in multiple colours and has made use of the colour differences for the display of separate aspects. The new features that are found in these keyword dictionaries open up new paths for the design of classification schemes. Besides, there is scope for such 'graphic display schemes' to be included in all classification schedules.

The various indexing, coding and classification systems should be studied by way of controlled experiments and the possibility of incorporating the salient features of them in future classification shcemes should be attempted. It should be recognized that these different operations have a common objective and that they are only complementary.

The viability of schemes devoid of 'main classes' should be tested empirically. Concepts from different subject areas should be drawn and later assembled on the basis of general categories, i.e. there will be as many concept groups as the number of general categories. The general categories chosen should be easily identifiable and valid. The five fundamental categories postulated by Ranganathan are not enough to bring in a helpful and functional assemblage of concepts. The sequence of concepts under each category will assume extreme importance in such a scheme and so different possibilities should be attempted. Increased use should be made of wide number of role indicators capable of representing all identified relationships. Such a scheme is likely to have better validity in mechanical systems. Generation of a unified dictionary of relevant 'concepts', each 'concept' being tagged with a symbol indicating the category to which it belongs, might suffice in such cases. If the withering away of 'main classes' brings in problems that cannot be solved in the current development of classification theory then broad user areas should be used as 'labels' to assign a contextual meaning to concepts. Such a subject area will not be deemed as the product of the first round division of the universe of knowledge. Another possible approach would be to consider a classification scheme which has different user areas as an assemblage of independent schemes, but guided by the same general postulates and constructional principles. Each section will in principle represent the whole universe of knowledge; but in practice cover only the concepts which have gained literary warrant in that specific user area. Provision could of course be made for extracting concepts scheduled in one section for purpose of synthesising in another. However, it might be necessary in certain cases to list the same concept in different sections. These approaches are two among the many possible ones.

The design of a classification scheme, even the mechanical part of enumeration, is an extremely arduous job. Ranganathan estimates [R6] that a hundred man years are required for the full pursuit of the design of an analytico-synthetic, self-perpetuating, depth classification scheme. New and radical experiments are necessary in the field of the design of classification scheme for the realization of such an objective.

4.5 Human-Artifact Interaction

The word 'Artifact' which means products of human industry is used here in the generic sense to cannote both machines and systems. Rapid progress could be made in any scientific field only by a wilful, purposive, interaction of humans and artifacts. These two dynamic entities should function in a complementary way contributing towards The wide application of computers in the a common goal of overall system efficiency. information field has positively demonstrated that computer can be a powerful, and under certain conditions economic, tool in the armoury of the information scientist. Lawlor has written with special reference to the computer application in the field of Law that "a properly designed and operated machine-processing system can locate a pearl on a pebbly beach with greater certainty than can a lawyer, and with the expenditure of less lawyer effort per pearl, and for fewer client dollars per pearl. This is especially true when many different searchers are trying to locate different pearls on the same beach and where every searcher can make use of the same pearl if it applies to his problem" [L2]. This aspect holds validity not only in the case of Law but in many other subject areas, especially in science and technology. Conventional classification schemes also have subscribed considerably to the recent advances in the IR field and are being gradually oriented to meet not only the needs of manual but also mechanical systems. "Modern methods of making classification schemes, with their highly efficient devices for expressing not only the parts of a complex subject but also the interrelations between them, are equally suitable both for traditional library use on shelves and in catalogues and for selection by mechanical and electronic equipment. The leading thinkers on both sides of this debate have constantly urged that there should be greater exchange of views and information and this surely, if slowly, growing" [F5]. There is no point in getting embroiled in abstract discussions about the superiority of one system over the other or that of humans over artifacts. The relative merits and place of various approaches should be assessed by carrying out objective empirical studies. Machines may be said to be better suited in areas where accurate, fast, consistent and repetitive works are to be done. Even in such cases the task of instructing or programming the machines will be the responsibility of humans. Most of the intellectual operations associated with indexing, coding and classification systems, for example, recognising and analysing concepts ingrained in documents, should for many more years be relegated advantageously to humans only. It is time for the commencement of an informed 'dialogue' between the various systems which facilitate subject approaches to document and information bits.

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Table 1
General Categories present in different Classification/Coding Systems

No	System designer	System/Reference	General categories
1	S. R. Ranganathan	Colon Classification	Personality Matter Energy Space Time
2	Gerard Cordonnier	Report presented at the Dorking Conference (1957)	Organisms and services (origin, or subject, of documents) (nature; places) Persons (miscellaneous categories ...) Individuals (living beings ...); biological conditions ... Bodies (natural; simple, compound;; ...) miscellaneous conditions ...) Miscellaneous equipment, (property fittings, ...) Miscellaneous actions, (physical; technical; economic; ...) Intellectual concepts Documentary forms ... Time
3	Barbara Kyle	a) Revue de la Documentation. 26(1):859, 17-21 Ref. [de G1]	Natural phenomena Artifacts (i. e. products of human industry) Activities Special schedule of aims and purposes to be used in the social sciences Imaginative literature and music, perhaps also religious and philosophical speculations Form, space, time (common subdivisions)
		b) Kyle Classification for social sciences Ref: [F1]	Activities Personalities
4	B. C. Vickery	a) Ref: Metcalfe, John: Information, indexing and subject cataloguing, 1957. p. 286	Personality Part Substance Action Property Operation
		b) Faceted classification: a guide to construction and use of special schemes. 1960 - for science and technology	Substance (Product) Organ Constituent Structure Shape Property Object of action (patient, raw material) Action Operation Process Agent Space Time

Table 1 - Contd.

No	System designer	System/Reference	General categories
		c) Classification and indexing in science. 2nd ed. 1959 - for soil earth sciences	Kinds of soil Structure Constituents (including organisms) Properties Natural processes Operations on soils (including the substances used as fertilizers) Laboratory techniques Generalities (Properties of qualities and of processes; Apparatus, equipment, instruments, construction, tests, maintenance, norms; Operations on the processes; Logical operations)
5	D.J. Foskett	a) Classification for Occupational Safety and Health Ref: [de Gl]	B Physical agents and natural phenomena C-G Substances H-J Premises, equipment, processes and operation K Organization of labour and industrial structure L Fire and explosions M-N Pathology P Physiology and psychology Q Research techniques R Medical prevention and treatment S Techniques of safety and health T Equipment for individual protection V Organization of safety and health W Categories of persons X Industries Y Special aspects Z Generalia
		b) Metal Box Company's Classification System Ref: [de Gl]	(1) Products (2) Parts (3) Materials (4) Operations (5 & 6) Packing and Crating
6	Pierre Rennes	CPA (Centre de Psychologie Appliquee) code Ref: [de Gl]	Knowledge-sciences Fields of Application Functions Methods Instruments Behaviour Anomalies States Relationships Processes Operations Representations (graphic and mental) Documents Agents-media

Table 1 - Contd.

No	System designer	System/Reference	General categories
			Places-organizations
			Countries
			Groups
			Individuals
			Individual characteristics
			Individual traits
			Anatomy
			Qualities
			Dimensions and sizes
			Indicia
			Concepts

Table 2
Role Indicators used in different Classification/Coding Systems

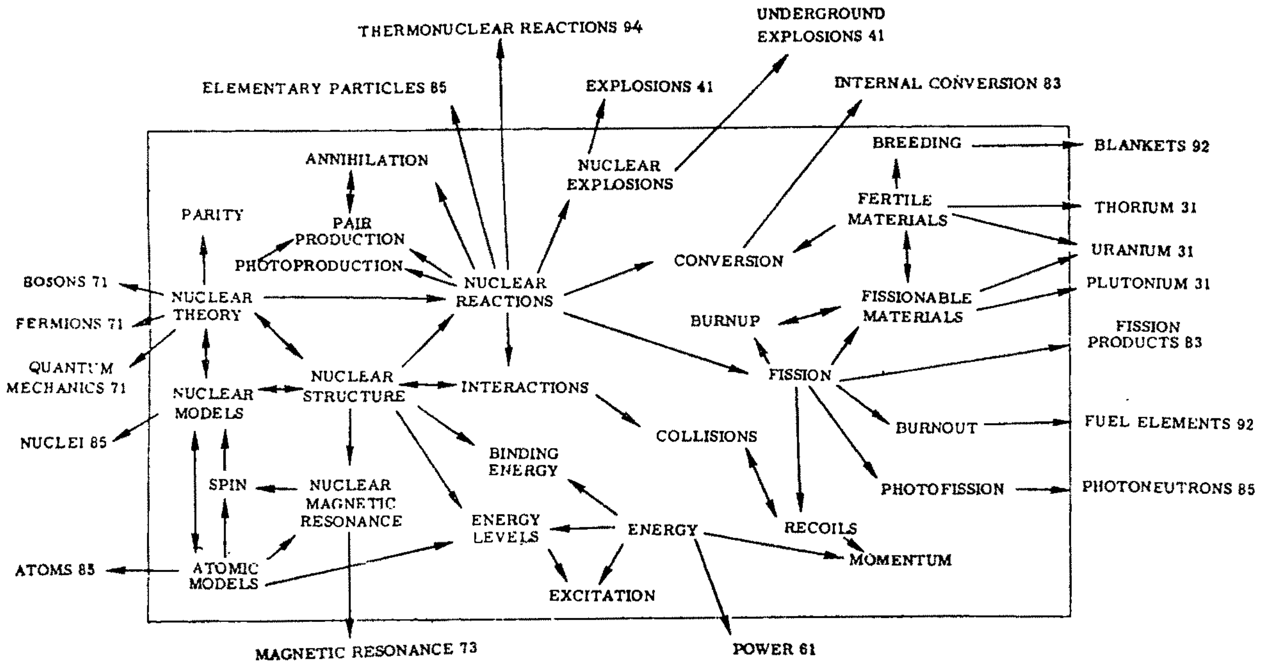
No	System designer	System/References	Relations & Role indicators		
1	Paul Otlet & Henri La Fontaine	Universal Decimal Classification	Addition, extension and synthesis	+, /, and '...	
			Relation sign	:	
			Common auxiliaries of language	=	
			Common auxiliaries of form (of presentation)	(0 ...)	
			Common auxiliaries of place	(1) to (9)	
			Common auxiliaries of race and nationality	(=...)	
			Common auxiliaries of time	"..."	
			Alphabetical and non-UDC numerical specification	A/Z I, II, III, etc.	
			Common auxiliaries of point of view	.00 ...	
			Special (auxiliary) subdivisions	-0 / -9, and .0	
2	S. R. Ranganathan	Colon Classification		Phase	Intra-facet
			General	a	j
			Bias	b	k
			Comparison	c	m
			Difference	d	n
			Influencing	g	r
				Connecting Symbols	
			Personality	,	
			Matter	;	
			Energy	:	
			Space	.	
			Time	'	
3	J. E. Farradane	Ref: [F1]	Operators		
			Mental time or memory	→	

Table 2 - Contd.

No	System designer	System/References	Relations & Role indicators				
			Concurrent	non-time Concurrence /0	Temporary Self-activity comparison /*	Fixed Association /;	Con-ceptual clarity
			Not-distinct	Equivalence /=	Dimensional state /+	Appurtenance /(	
			Distinct	Distinctness /)	Reaction /-	Causation /:	
4	J. W. Perry & Allen Kent	Semantic code Ref:[dc Gl]	Role Indicators Materials Properties Processes Condition Relations for organizations and person				
			Besides these a number of other relationships are also shown, e. g:				
				Categoric		A	
				Intrinsic		E	
				Inclusive		I	
				Aggregate		O	
				Productive		U	
				Affected		Q	
				Instrumental		W	
				Negative		X	
5	Hans Selye	System of Symbolic Stenography (SSS) for Physiology and Medicine. 1958 Ref: [de Gl]		Action			←
				To combine two symbols in order to form a third			-
				Separation of coded elements in static codification			/
				Relationship between two targets, or between two agents			:
				Decrease, deficiency, or hypofunction			↓
				Increase, excess or hypofunction			↑
				Anti-compounds			↧
				In (for chemical content); used also to indicate the method of administration of medicine			< >
				Pseudo			" "
				Deprivation, interruption of a treatment			(-)
				Without			:-
				Inserted following the symbol of an element, its radioactivity			*
				Female			♀
				Male			♂

Table 2 - Contd.

No	System designer	System/References	Relation & Role indicators	
6	J. E. Holmstrom	Classification under ramified keywords Ref: [de Gl]	Action	A
			Corporate name	C
			Equipment	E
			Geographical name	G
			Personal name	P
			Quality	Q
			Substance	S
			Title of a publication on what is described	T
7	P. Braffort & L. Leroy	CEA (French Atomic Energy Commission) Classification Ref: [de Gl]	Action	...>
			Relating to	A
			Results in	R
			By means of	M
			Location	L
			For the purpose of	B
			Other than action	
			Property toward object, or object toward more general object, or condition toward action	A
			Toward what is produced	R
			Toward that which serves as a means	M
			Toward the location where the action takes place	L
			Toward the objective	B
			Negation symbol	N



ANNIHILATION
ATOMIC MODELS
BINDING ENERGY
BREEDING
BURNOUT
BURNUP
COLLISIONS
CONVERSION
ENERGY
ENERGY LEVELS
EXCITATION
FERTILE MATERIALS
FISSION
FISSIONABLE MATERIALS
INTERACTIONS
MOMENTUM
NUCLEAR EXPLOSIONS
NUCLEAR MAGNETIC RESONANCE
NUCLEAR MODELS
NUCLEAR REACTIONS
NUCLEAR STRUCTURE
NUCLEAR THEORY
PAIR PRODUCTION
PARITY
PHOTOFISSION
PHOTOPRODUCTION
RECOILS
SPIN

EURATOM/CID KEYWORD-THESAURUS	NUCLEAR PHYSICS	GROUP **81**

00	11	12	13	14	15	16	21	22	23	24	31	32	33	34	35	36	37	41	42	43	44
45	51	52	61	62	63	64	71	72	73	74	75	76	81	82	83	84	85	91	92	93	94

CHART - 2

Basis of Classification: COOLANT — coolant materials and physical state

- FLUID COOLANT
FLUID COOLED REACTORS
  - GASEOUS COOLANT
    - PERMANENT GASES
GCR
      - AIR — **AIR COOLED REACTORS**
      - CO_2 — CARBON DIOXIDE COOLED REACTORS
      - He — **HELIUM COOLED REACTORS**
      - N — NITROGEN COOLED REACTORS
    - VAPORS
VAPOR COOLED REACTORS
      - WATER — **STEAM COOLED REACTORS** or **WATER COOLED REACTORS**
        - SATURATED STEAM — SUPERHEAT REACTORS
          - Integral Type — ISHR
          - Separate Type — SSR
          - H_2O — SUPERHEAT REACTORS and **LIGHT WATER COOLED REACTORS**
        - H_2O — **STEAM COOLED REACTORS** and **LIGHT WATER COOLED REACTORS**
  - TWO-PHASE COOLANT
    - VAPOR-LIQUID MIXTURES
      - WATER — **STEAM-WATER MIXTURE COOLED REACTORS** or **WATER COOLED REACTORS**
        - STEAM-WATER SPRAY — **FOG COOLED REACTORS**
          - H_2O — **FOG COOLED REACTORS** and **LIGHT WATER COOLED REACTORS**
        - H_2O — **STEAM-WATER MIXTURE COOLED REACTORS** and **LIGHT WATER COOLED REACTORS**
  - LIQUID COOLANT
LIQUID COOLED REACTORS
    - LIQUIDS
LIQUID COOLED REACTORS
      - WATER — **WATER COOLED REACTORS**
        - BOILING WATER — **BWR**
          - With Nuclear Superheating — BWR WITH NUCLEAR SUPERHEATING
          - H_2O — **BWR** and **LIGHT WATER COOLED REACTORS**
          - D_2O — **BWR** and **HEAVY WATER COOLED REACTORS**
        - PRESSURIZED WATER — **PWR**
          - H_2O — **PWR** and **LIGHT WATER COOLED REACTORS**
          - D_2O — **PWR** and **HEAVY WATER COOLED REACTORS**
        - H_2O — **LIGHT WATER COOLED REACTORS**
        - D_2O — **HEAVY WATER COOLED REACTORS**
      - ORGANIC COMPDS. — **OCR**
    - LIQUID METALS
LIQUID METAL COOLED REACTORS
      - Bi — **BISMUTH COOLED REACTORS**
      - Hg — **MERCURY COOLED REACTORS**
      - Li — **LITHIUM COOLED REACTORS**
      - Na, NaK — **SCR**
      - Pb — **LEAD COOLED REACTORS**
    - MOLTEN SALTS
MSR

SCATTERING OF ARTICLES BY INDIAN AUTHORS IN FOREIGN PERIODICALS

A SAMPLE SURVEY

B GUHA
A K GUPTA
A JOSEPH
M L KACHROO
INSDOC, Delhi-12.

A large number of articles by Indian authors are published in foreign scientific periodicals. A study of about 750 periodicals which were covered in the Insdoc List of 1964 shows that 1406 such articles were published in one year. Subject-wise distribution shows that there were 364 articles in Chemistry, 323 in Physics, 175 in Medicine and 110 in Mathematics. The first three periodicals accepting largest number of such articals were the Physical review (75), Nuovo Cimento (50) and Nuclear Physics (45). One particular point is emphasised as a cause that is the non-availability of specialised periodicals, within the country, in many developing subjects. Fallow regions where new periodicals may be started or where existing general periodicals may be split are mentioned.

1 NATIONAL DISTRIBUTION OF SCIENTIFIC LITERATURE

'A relation seems to exist between national strength and scientific research activity', and the best index of research activity of a country is its research literature output. The most convenient way to measure the research literature output of a country and hence to assess its relative strength is to study the coverage of well-known abstracting periodicals in major subject fields. On the basis of such a study the Russians were able to claim in 1961 "According to our calculations [coverage in Referativnyi Zhurnal, Khimiya in 1957], our country has reached second place in world publications on chemical problems, and now approximately 14% of all the chemical publications in the world are those of the Soviet Union". On the other hand, in the U.S.A., it is taken as a matter of considerable pride and elation that U.S. research underlies 23% of world literature in chemistry and occupies the first position. This is based on the coverage of Chemical Abstracts 1960 [1]. In another major field viz. Physics we have a valuable recent study to compare the figures [2]. Here also we see almost the same picture. The U.S.A. occupies the first position and Russia the second as observed from the number of abstracts covered in the 1961 issues of the Physics Abstracts.

2 INDIA'S SHARE

It would be very interesting to apply this convenient and workable yardstick to measure the national strength of a developing country like India. In the first report cited above India's ranking is not very significant. All Commonwealth countries together contributed only 13% of world literature and out of this 55% was from the United Kingdom. Within the Commonwealth, India's position was second. In the second report India's position was 9th, contributing only 1.7% (352 articles) of world literature in Physics. Surely, not a very happy position to be proud of.

21 Scattering in Foreign Periodicals

The contention of the present study is that a comparison of figures of the above type cannot give a very helpful and true indication of India's research activity for a number of reasons. Apart from the fact that India's contributions are not exhaustively covered even in the best abstracting periodicals, we want to show subsequently that a substantial proportion of truely Indian contributions, possibly best contributions, are actually published in foreign periodicals. Naturally, when national origin for papers covered in abstracting periodicals are counted they go to enhance the position of other countries. There are various reasons for this scattering of Indian contributions in foreign periodicals. But so much importance is attached to it, that the worth of an Indian scientist is almost judged by the number of papers he has published in foreign periodicals. This has further prompted younger scientists to send out their papers to foreign periodicals. As a result, we have observed in this study, an Indian Food Technologist has gone to the incredible extent of publishing a paper on the preparation of 'Chapatty' in a French periodical.

22 Volume of Scattering

So far no study has been made to survey and assess the volume of scattering of Indian contributions in foreign periodicals. The starting of the Indian Science Abstracts this year has further prompted us to undertake such a survey, as it has rightly taken the policy of including all papers published by Indians (from India) in foreign periodicals.

The present study is only a sample survey in the sense that articles noticed in the Insdoc list during 1964 have only been checked and the contributions by Indian authors in foreign periodicals taken for study. It may be emphasised here that Insdoc list covers only about 750 foreign periodicals and all the issues of all the titles might not have been covered during the period of study. Moreover, only original articles are covered, short communications, notes and letters to editors are excluded. We believe that even this sample survey gives an idea about the volume of scattering and reveals a clear pattern of this scattering as to the most popular periodicals, their place of publications etc. The following table gives a subject breakdown of the articles scattered.

3 SCATTERING IN DIFFERENT SUBJECT FIELDS

It would be evident from Table 1 that the Indian Chemists had sent out the largest number of contributions to foreign periodicals — 364 papers in 55 periodicals. The second largest group was the Physicists who contributed 323 papers in 49 periodicals. The third position is held by Medicine with 175 papers (including Pharmacology). Considering the volume of literature published within the country in the field of Medicine this amount is not much. What is more surprising is the fact that Mathematicians had sent out as many as 110 papers.

31 Scattering in Pure Sciences

From the above figures, it would possibly be safe to infer that contributions in pure sciences have a greater tendency to go out, as more than 50% of the papers have been only from three subject viz, Mathematics, Physics and Chemistry.

Table 1: Subject Breakdown of Scattering

	Subject	No. of articles	Published in No. of periodicals	From no. of countries
B	Mathematics (including) Mechanics, Astronomy & Astrophysics	110	41	10
C	Physics	323	49	11
D	Engineering	83	30	5
E	Chemistry & Biochemistry	364	55	10
F&M	Technology and Useful Arts	97	42	7
G	Biology & Biophysics	29	19	5
H	Geology	35	10	5
HX	Mining	5	1	1
I	Botany	50	19	6
J	Agriculture	49	20	6
JX	Forestry	1	1	1
K	Zoology	44	25	7
KX	Animal Husbandry	21	11	3
L	Medicine	138	61	4
LX	Pharmacognosy & Pharmacology	37	6	2
U28	Meteorology	18	3	2
	Total	1406	323	17

It would be interesting to study in detail the scattering of articles in the three above-mentioned subjects.

32 Scattering in Mathematics

321 Mechanics

Out of 110 papers on Mathematics, 34 were on Mechanics, 21 on Astronomy and Astrophysics, only 3 on Statistics and the remaining 52 on other branches of Mathematics. The large number of papers going out of the country on Mechanics cannot escape one's attention. The possible reason it that there is no specialised periodical on Mechanics in the country. Naturally, an author has to decide either publishing his paper in a domestic periodical on General Science, Mathematics or Physics or sending out his paper to a more specialised foreign periodical. It may be noted here that at least one periodical is shaping itself very well into a specialised periodical on Mechanics. The periodical is the Journal of Science and Engineering Research (published by the Indian Institute of Technology, Kharagpur), which has, inspite of its title, a preponderance of articles on Mechanics.

The volume of papers going out also suggest that there is possibly a need and scope for the publication of a specialised periodical within the country, as the I. I. T. periodical mentioned above published only about 40 articles in a year. The I. I. T., itself may consider the possibility of separating and publishing the papers on Mechanics under a new title and other papers under the present title. The new title would surely attract some of the papers which go out or seep into general science periodicals. Another Indian publication on the subject is the Indian journal of theoretical Physics, Calcutta. But it is able to publish about 12 papers only in a year and is always behind publication date.

As we come to consider the names of periodicals where Indian authors have preferred to contribute, so far as Mechanics is concerned it is interesting to find that, contrary to usual trend, as many as 22 papers have gone to periodicals originating from countries other than Britain or the U. S. A. Here are the titles and ranking of periodicals according to the number of papers accepted:

Table 2: Ranking of Periodicals in Mechanics

Rank	Title of Periodicals	No. of articles
1	Applied scientific research, the Hague (Sec A & B)	10
2	Journal of the Physical Society of Japan, Tokyo	8
3	Zeitschrift fur angewandte Mathematik und Mechanik, Berlin	4
4	Journal of fluid mechanics, Cambridge	3
5	Journal of the Acoustical Society of America, New York	2
5	Journal of the Franklin Institute, Philadelphia	2
5	American Institute of Aeronautics and Astronautics Journal	2
6	Journal of applied mechanics, New York	1
6	Journal of mathematics and mechanics, Bloomington	1
6	Quarterly J mechanics and applied mathematics, Oxford	1
	Total	34

322 Astronomy and Astrophysics

What has been said above holds good for Astronomy and Astrophysics also, as there are no specialised domestic periodical on this subject. Naturally those contributors who want to communicate their ideas to specialists must send their contributions to foreign periodicals.

The details of scattering of this subject are as follows:

Table 3: Ranking of Periodicals in Astronomy & Astrophysics

Rank	Title of Periodicals	No. of articles
1	Astrophysical journal, Chicago	4
2	Journal of atmospheric and terrestial physics, London	3
2	Monthly notices of the Royal Astronomical Society, London	3
2	Planetary and space science, New York	3

Rank	Title of periodicals	No. of articles
2	Zeitschrift fur Astrophysik, Berlin	3
3	Journal de observateurs, Marseille	2
4	Annales de astrophysics, Paris	1
4	IEEE transactions on military electronics, New York	1
4	Publications of the Astronomical Society of Japan, Tokyo	1
	Total	21

323 Statistics

It was surprising to find that only three articles were published outside on an active subject like Statistics. Possibly this is due to the publication, within the country, of a specialised periodical of high standard in the field viz., the Sankhya, the Indian journal of statistics. It may, be noted here also that a few important publications in the field fiz., Journal of the Royal Statistical Society, Journal of the American Statistical Association, Annals of mathematical statistics etc. have been left out from this survey.

324 Other Branches of Mathematics

In other branches of mathematics 52 articles were contributed in 21 periodicals. Although an U.S. periodical attracted the largest number of articles, it is interesting to note that the second and third ranks were held by two well known German periodicals. The details are as follows:

Table 4: Ranking of Periodicals in Mathematics

Rank	Title of periodicals	No. of articles
1	Proceedings of the American Mathematical Society, Providence	9
2	Mathematische Annalen, Berlin	8
3	Mathematische Zeitschrift, Berlin	7
4	Journal of mathematics and mechanics, Bloomington	5
5	Quarterly journal of mathematics, Oxford	4
6	Duke mathematical journal, Durham	3
7	Proceedings, Koninklijke Naderlandse Akademie van Wetenschappen, Ser A, Amsterdam	2
7	Proceedings of the National Academy of Sciences, Washington	2
8	(14 different titles)	(1 each)
	Total	52

4 SCATTERING IN PHYSICS

In Physics, as many as 323 articles were published outside. We have mentioned in Sec 2 above that India's position was ninth in world literature in Physics with only 352 articles. It is evident that India's position would have been different if these 323 additional articles were published in Indian periodicals.

41 Nuclear Physics

In analysing the subject matter of the articles, one interesting fact attracted our attention. Out of these 323 articles, as many as 184 were on one branch of Physics only, viz. Nuclear Physics. The reasons are not far to seek. This is a very active branch of research and study in Physics, so much so that possibly no country can afford to lag behind. India also has stepped up activities in this field but so far there is no specialised periodical within the country to serve as an effective vehicle for the communication of research results in the subject. Naturally, a large proportion of Indian contributions go out to foreign periodicals. There seems to be preference for three periodicals as can be noted in the following table:

Table 5: Ranking of Periodicals in Nuclear Physics

Rank	Title of periodicals	No. of articles
1	Nuclear Physics, Amsterdam	45
2	Physical review, New York	43
3	Nuovo Cimento, Bologna	41
4	Proceedings of the Physical Society, London	9
5	Canadian journal of Physics, Ottawa	6
6	Journal of molecular Spectroscopy, New York	5
6	Physica, 's Gravenhage	5
6	Progress of theoretical physics, Osaka	5
7	Journal of chemical physics, New York	4
8	Acta physica austriaca, Wien	3
8	Molecular physics, London	3
8	Nuclear instruments and methods, Amsterdam	3
9	(3 periodicals)	(2 each)
10	(6 periodicals)	(1 each)
	Total	184

It can be safely inferred from the above table, both on the strength of volume of outgoing literature and the high standard of the periodicals accepting them, that a periodical of very high standard can be started within the country.

42 Other Branches of Physics

Other branches of Physics taken together accounted for 139 articles. Here also, there seems to be a great preference for the *Physical review.* The breakdown according to ranking of periodicals is as follows:

Table 6: Ranking of Periodicals in Physics

Rank	Title of Periodicals	No. of articles
1	Physical review, New York	32
2	Canadian journal of physics, Ottawa	11
3	Journal of chemical physics, New York	10
4	Journal of the Optical Society of America, New York	9
4	Nuovo Cimento, Bologna	9
5	Physica, 's Gravenhage	8
6	Journal of the Physical Society of Japan, Tokyo	7
7	Journal of applied physics, New York	6
8	Proceedings of the Royal Society, Ser A, London	5
9	Journal of molecular spectroscopy, New York	4
10	Acta physica austriaca, Wien	3
10	British journal of applied physics, London	3
10	Acta physica polonica, Varsovie	3
10	Proceedings of the Physical Society, London	3
11	(5 periodicals)	(2 each)
12	(16 periodicals	(1 each)
	Total	139

It may be specially mentioned, that among the titles containing single article was a Russian periodical viz. ZETF. The article was in Russian.

5 SCATTERING IN CHEMISTRY

We have already said that Indian chemists had sent out as many as 364 papers during this period. The breakdown according to specialities were as follows:-

1.	Physical chemistry	84
2.	Analytical chemistry	54
3.	Inorganic chemistry	18
4.	Organic chemistry	109
5.	Biochemistry	99
	Total	364

51 Physical Chemistry

In Physical Chemistry there seems to be a strong preference for U.S. periodicals as can be seen from the following table. Only the first few rankings with 5 or more articles are given:

Table 7: Ranking of Periodicals in Physical Chemistry

Rank	Title of Periodicals	No. of articles
1	Journal of Physical chemistry, Baltimore	19
2	Journal of the American Chemical Society, Washington	10
3	Journal of chemical physics, New York	8
4	Bulletin of the Chemical Society of Japan, Tokyo	5
4	Journal of the Chemical Society, London	5
4	Transactions of the Faraday Society, Aberdeen etc.	5

52 Analytical Chemistry

There is a strong preference for only two specialised periodicals in this field. Only the first four rankings with 3 or more articles are given below:

Table 8: Ranking of Periodicals in Analytical Chemistry

Rank	Title of Periodicals	No. of articles
1	Analytical chemistry, Washington	14
2	Talanta, London	13
3	Bulletin of the Chemical Society of Japan, Tokyo	4
4	Analyst, Cambridge	3
4	Analytica chimica acta, Amsterdam	3
4	Journal of chromatography, Amsterdam	3
4	Zeitschrift fur analytische Chemie, Berlin etc.	3

53 Inorganic Chemistry

Compared to other specialities in Chemistry, articles in Inorganic Chemistry have been very few, only 18 in numbers distributed in only 5 periodicals. There were only two specialised periodicals as can be seen below:

Table 9: Ranking of Periodicals in Inorganic Chemistry

Rank	Title of Periodicals	No. of articles
1	Zeitscherift fur anorganishce und allgemeine Chemie, Leipzig	6
2	Journal of the American Chemical Society, Washington	4
3	Journal of the Chemical Society, London	3
3	Journal of inorganic and nuclear chemistry, London	3
4	Canadian journal of chemistry, Ottawa	2
	Total	18

54 Organic Chemistry

Organic Chemistry accounted for the largest number of articles in Chemistry - 109 articles. It is interesting to note that they were scattered in as many as 21 periodicals yet there was preference for a few periodicals, as can be seen in the following table:

Table 10: Ranking of Periodicals in Organic Chemistry

Rank	Title of Periodicals	No. of articles
1	Tetrahedron, London	20
2	Journal of organic chemistry, Baltimore	16
3	Journal of polymer science, New York (Pt. A)	14
3	Journal of the American Chemical Society, Washington	14
4	Journal of Chemical Society, London	11
5	Canadian journal of chemistry, Ottawa	8

6	Transactions of the Faraday Society, Aberdeen	4
7	(2 periodicals)	(3 each)
8	(4 periodicals)	(2 each)
9	(8 periodicals)	(1 each)
	Total	109

It is to be noted that although Tetrahedron is a periodical of recent origin yet how popular it has become. Among the titles containing single article was the Russian periodical Doklady. The article was naturally in Russian.

55 Biochemistry

Next to Organic Chemistry, Biochemistry accounted for the largest number of contributions. It has to be noted that this is inspite of the availability of a specialised periodical within the country. In this field also we find strong preference for a few periodicals.

Table 11: Ranking of Periodicals in Biochemistry

Rank	Title of Periodicals	No. of articles
1	Biochimica et biophysica acta, Amsterdam	20
2	Journal of biological chemistry, Baltimore	14
3	Biochemical journal, London	12
4	Archives of biochemistry and biophysics, New York	9
5	Tetrahedron, London	7
6	Analytical biochemistry, New York	6
6	Enzymologia, Hague	6
7	Journal of the American Chemical Society, Washington	5
7	Proceedings of the National Academy of Sciences, Washington	5
8	Journal of bacteriology, Baltimore	3
8	Journal of molecular biology, London	3
9	Collection de travaux chimiques de techcoslovaquie, Prague	2
10	(9 periodicals)	1 each
	Total	99

56 Over-all Rankings in Chemistry

Since some of the periodicals have articles from more than one specialities considered above, it would be appropriate to give an over-all rankings mentioning only the first five positions.

Table 12: Ranking of Periodicals in Chemistry

Rank	Title of Periodical	No. of articles
1	Journal of the American Chemical Society, Washington	35
2	Tetrahedron, London	28
3	Biochimica et biophysica acta, Amsterdam	20
4	Journal of the Chemical Society, London	19
4	Journal of physical chemistry, Baltimore	19
5	Journal of organic chemistry, Baltimore	17

57 Periodicals Publication Pattern in Chemistry

After presenting a detailed picture of the scattering of Indian chemical literature in foreign periodicals, it would perhaps be useful to make a few remarks at this stage. With increasing specialisation and rapidly growing literature in every branch of science there has been a general complaint from the scientist, as receiver of information, that a journal contain too much material of no interest to the complainant. To reduce this load of uninteresting material publishers have been striving to limit the scope of periodicals, split an existing general periodical into different series or titles or altogether offer new titles, each with a restricted subject coverage. An interesting example, of this process, would be the publication programme of the American Chemical Society. From its original 'catch-all' type publication viz. Journal of the American Chemical Society, the Society has rightly started a number of titles to cater to the needs of different specialities in Chemistry. Thus the Society publishes today periodicals on Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Analytical Chemistry and so on. In fact if the trend continues, it is said, we may be offered such titles as 'Journal of the Mechanism of the Solvolytic Reaction' or 'Journal of the Molecular Structure of Compounds Containing not more than Four Atoms' and so on. [3]. In Britain also a society journal viz. Journal of the Chemical Society has been dominating the field with its overwhelming emphasis on organic chemistry. There was no attempt to split it up into specialised titles. However, the success and immense popularity gained by two recent periodicals viz. Talanta and Tetrahedron (Pergamon Press) on Analytical and Organic chemistry respectively, clearly points out that time was ripe for specialised periodicals. In India, even today the scene is dominated by general periodicals like Journal of the Indian Chemical Society and of late Indian journal of chemistry. Only in the field of Biochemistry we have one or two specialised periodicals. The popularity of some of the foreign specialised chemical periodicals amongst our scientists, both as contributors and readers, makes us feel that India can also launch a few specialised periodicals in Chemistry. Perhaps, the Indian Chemical Society itself can take the initiative.

6 OTHER SCIENCES

We have given above a detailed picture of scattering of Indian contributions in three major fields viz. Mathematics, Physics and Chemistry. In the subsequent sections of this paper, only the salient features in other subjects will be mentioned. It has already been said that articles in the pure sciences have a greater tendency to go out than articles in the applied sciences or technologies. The possible reasons for this divergence of practice between these two groups of Indian scientists may be as follows:

a) It can be said generally, that a scientist doing research in pure science intends to communicate new idea through an article. Hence he can afford to publish it in a foreign periodical even if it takes a longer time to see it in print. Whereas a scientist doing research in an applied science or a technologist communicate new information or a new process through an article. Here, the time factor is more important. He would try to get it in print as quickly as possible. Hence domestic periodicals are preferred in most cases.

b) There are a number of specialised periodicals on technologies available within the country. In this respect it may be specially mentioned, that the journals of the various C.S.I.R. laboratories are really doing good service to Indian technologists.

c) It may also be possible, though may sound uncharitable, that Indian contributions on technologies are not of that standard to find place in periodicals originating from highly industrialised and technologically advanced countries.

With these few remarks we shall now consider some of the salient features of scattering of articles in Engineering, some of the technologies, Biological sciences and Medicine.

62 Engineering

Only 83 articles were published and it is interesting to note that as many as 50 of them were on Electronic Engineering. The IEEE transactions claimed 19 articles in its various sections. The other preferred periodicals were the Journal of electronics and control, London (6), Electronic engineering, London (4), Proceedings of the Institution of Electrical Engineers, London (4), etc.

63 Technology

All the technologies together accounted for only 97 articles. The largest single group was the Chemical Engineering, accounting for 23 articles. The two most favoured periodicals with largest concentration of articles were the Food technology, Champaign and the Journal of American Oil Chemists Society, Chicago with 7 articles each.

64 Biological Sciences and Geology

It seems the most important speciality to attract Indian contributions outside was Microbiology. It has to be mentioned that research in Microbiology (including Bacteriology and Virology) has gained importance in India only in recent times. Till recently Microbiology was being studied as part of Pathology only. The only Indian periodical on the subject viz. Indian journal of microbiology, Calcutta started in 1961. The first two favoured periodicals were Journal of bacteriology, Baltimore (6 articles) and Archiv fur Mikrobiologie, Berlin (3 articles).

In Geology, out of a total of 35 articles as many as 20 articles were on one speciality only viz. Crystallography. The importance of this subject can be easily gauged from this. The most important point to note here is that out of these 20 articles, as many as 17 were concentrated in only one periodical, viz. Acta Crystallographica, Copenhagen.

In Botany and Agriculture almost equal number of articles were sent out, 50 and 49 respectively. The rankings of the periodicals in these two subjects are as follows:

Table 13: Ranking of Periodicals in Botany and Agriculture

Rank	Title of Periodicals	No. of articles
1	Caryologia, Florence	10
2	Phytopathology, Lancaster, Pa	8
2	Soil science, Lancaster, Pa	8
2	Grana Palynologica, Stockholm	8
3	Canadian journal of botany, Ottawa	6
3	Phytopathologische Zeitschrift, Berlin	6
3	Plant physiology, Lancaster, Pa	6

An important observation has to be made about the first three titles in the above table. India has three important specialised periodicals covering exactly the same areas of study as that of these three titles. They are the Nucleus, Calcutta, Indian Phytopathology, Delhi, and Journal of the Indian Society of Soil Science, New Delhi. In fact the first two titles are international periodicals. To allay any misapprehension, it may be pointed out that because of the existance of these titles most of the research output are published within the country, only a portion goes out.

In Zoology it is difficult to single out the most favoured periodical as there has been a great scattering - 44 articles were published in as many as 25 different periodicals. In fact the first position is shared by 7 different titles with only 3 articles each.

65 Medicine and Pharmacology

In this field 175 articles were published of which 37 were on Pharmacology. Another speciality responsible for sending out a number of articles seems to be Ophthalmology. The ranking of the periodicals are as follows:

Table 14: Ranking of Periodicals in Medicine

Rank	Title of Periodicals	No. of articles
1	Journal of pharmaceutical sciences, Washington	13
1	British Journal of ophthalmology, London	13
2	Archives internationales pnarmacodynamie et de therapie, Bruxelles	11
2	British medical journal, London	11
3	American journal of ophthalmology, St. Louis	10
4	Lancet, London	8
4	Proceedings of the Society of Experimental Biology and Medicine, New York	8
5	British journal of pharmacology and chemotherapy, London	5
5	Journal of urology, Baltimore	5
6	Circulation, New York	4
7	(8 titles)	3 each
8	(12 titles)	2 each
9	(39 titles)	1 each
	Total	175

It has already been pointed out that considering the total output of medical literature in India the number of articles going out is not much. It has also to be pointed out that not only we have a large number of domestic medical periodicals but we have also a number of specialised periodicals serving the needs of different specialities.

7 OVERALL RANKINGS

In this section we propose to give a combined ranking of the periodicals in all subjects. Only those titles which have published more than 15 Indian contributions have been included in the following table:

Table 15: Ranking of Periodicals in all Subjects

Rank	Title of Periodicals	No. of articles
1	Physical review, New York	75
2	Nuovo Cimento, Bologna	50
3	Nuclear physics, Amsterdam	45
4	Journal of the American Chemical Society, Washington	35
5	Tetrahedron, London	27
6	Journal of chemical physics, New York	25
7	Biochimica et biophysica acta, Amsterdam	24
8	Journal of physical chemistry, Baltimore	22
9	Journal of atmospheric and terrestrial physics, London	19
9	Journal of the Chemical Society, London	19
10	Acta crystallographica, Copenhagen	17
10	Journal of organic chemistry, Baltimore	17
10	Talanta, London	17
11	Canadian journal of chemistry, Ottawa	16

It can be seen from the above table that the first three positions are held by periodicals in Physics. Out of the 14 titles holding the top ranks 3 are in Physics, 9 in Chemistry, 1 in Crystallography and 1 in Atmospheric Physics.

As has been said all the above titles have published more than 15 Indian contributions in a year. It may be emphasised that there are many Indian periodicals which are not able to get or take the load of 15 articles per volume or per year. We would conclude this study by citing a few significant lines from the editorial of a recent issue of an well-known Indian periodical, which we believe is the silent prayer of many Indian editors "... To obtain good articles is fast becoming very difficult indeed. I write these few lines in the hope that some kind reader will send in his contribution on a subject which is so important in India today ... "

8 CONCLUSIONS

1. Research activity and hence national strength of India cannot be measured only by research literature output in domestic scientific periodicals, as can be done for countries like the U.S.A., or Russia. This is because a large proportion of Indian research literature output is published in foreign periodicals. This is unlike what happens in the U.S.A. or Russia.

2. The reasons for this scattering of articles are surely due to our use of the English language for scientific communication, desire on the part of authors to be better publicised and better recognised, our habit of attaching undue importance and credit on the authors contributing in foreign periodicals etc. But the important reason emphasised in this paper is that this scattering may be due to the non-availability of specialised periodicals, in many specialities, within the country. Many such fallow areas have been pointed out where there are scope for specialised periodicals. Nuclear Physics in an important fallow region in this sense.

3. Commercial publication of scientific periodicals is not well established in India. Hence, some of the universities, research institutions, scientific societies and organisations like the C.S.I.R. shall have to explore the possibilities of providing new media of communication in these fallow areas.

4. Foreign periodicals which are preferred by Indian contributors have been considered. Physical and Chemical periodicals have an overwhelming preferance. Although American and British periodicals are preferred, a large number of articles go to German, Japanese and international periodicals from Bologna, Florence, Amsterdam and Copenhagen.

5. An appeal has been sent out by the Indian Science Abstracts to all scientists in India through various research institutions in the country to send reprints of papers published outside. If they comply with, it would be possible to make a complete survey.

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REPORTING OF INDIAN AGRICULTURAL LITERATURE IN SOME C A B ABSTRACTING SERVICES

T S RAJAGOPALAN
B K SEN
S ROY
P D UPADHYAYA
INSDOC, Delhi-12.

Studies the coverage and speed of reporting of Indian literature in six CAB abstracting services viz, Soils and fertilisers, Plant breeding abstracts, Horticultural abstracts, Field crop abstracts, Animal breeding abstracts and Dairy science abstracts. Examines the time-lag in reporting Indian literature in the CAB services, using the Bibliography of scientific publications of South & South East Asia as the basis.

INTRODUCTION

The accelerated increase in the output of Indian scientific literature in recent years has been a topic of frequent discussions now-a-days. However, it has been experienced that our literature does not get disseminated to the outside world adequately. A few studies have, therefore, been undertaken earlier to examine the extent and the speed of reporting of Indian scientific literature in international abstracting and indexing services. The present paper on the extent and speed of reporting of Indian agricultural literature in some of the abstracting services of the Commonwealth Agricultural Bureaux (=CAB) is yet another in the series of such studies.

Indian Agricultural Literature

India publishes now 89 and 22 periodicals exclusively on Agriculture and Animal Husbandry subjects. It is found that over 1,199 and 393 articles on Agriculture and Animal Husbandry respectively have appeared in Indian periodicals during 1964. The Indian national bibliography has noticed in 1963 as many as 249 books under Agriculture. To the above output must be added the quota of literature accounted by pamphlets, bulletins, standards, reports etc. The present study, though a limited one, attempts to analyse as to how much of the Indian literature gets reported in the CAB services.

Sources for the Study

Six CAB abstracts viz., Soils and fertilizers, Plant breeding abstracts, Horticultural abstracts, Field crop abstracts, Animal breeding abstracts and Dairy science abstracts have been examined to study their performance in reporting Indian literature. India happens to be a member of CAB and it may be therefore expected that Indian literature would be adequately noticed by the CAB abstracting services.

The Bibliography of scientific publications of South & South East Asia (hereafter referred as Bibliography) (now replaced by the Indian science abstracts) has been taken as the base for analysing the Indian literature In the Bibliography, reporting of Indian literature may be regarded as fairly exhaustive and expeditious. As the Bibliography includes all the original articles it may be expected that the international abstracting services would consider many of them as worth reporting.

EXTENT OF REPORTING

Firstly the entries falling under the subject purview of the six CAB services have been located in the 1961 and 1962 volumes of the Bibliography. Care has been taken to select only those entries which belong to the umbral subjects covered by the CAB services. It is because such entries are expected to be covered without omission by the CAB services and there is no scope for doubt regarding their relevancy. In other words only core subjects of the respective CAB abstracting services have been taken into consideration in the selection of Indian documents. To that extent the present study may be a limited one and may not represent the entire output of Indian literature on the subjects. Entries thus located in the volumes of the Bibliography for the year 1961 and 1962 have been checked in the concerned

CAB abstracts through author index for their coverage. The search has been carried on in the concerned CAB services upto the years 1963 and 1964 respectively for the year 1961 and 1962 entries of the Bibliography with expectation that sometimes literature even if it is old by as much as two years may possibly be included in international abstracting and indexing services. A summary of the findings is given in Table 1. Tables 2 to 7 provide the following information in respect of the different abstracting services.

1. Extent of coverage in CAB services of Indian literature (as selected from the Bibliography of 1961 and 1962) with breakdown of articles accounted by each periodical.

2. Extent of coverage of periodicals as a whole in the CAB services.

Results of the Study

The results of the study are reviewed briefly as follows:

In the Soils and fertilizers 29. 8 percent of Indian literature checked in the study are covered in 1961 and 36. 0 percent in 1962. The number of periodicals not covered as a whole in the two years is 27 and 29 respectively as against 12 and 15 periodicals that are actually covered.

In the Plant breeding abstracts 63. 3 percent and 68. 6 percent are the coverages for the years 1961 and 1962. The number of journals not covered is 10 and 8 as against the number of journals covered namely 16 and 15 respectively for the years 1961 and 1962.

In the Horticultural abstracts the percentage of coverage is 32. 1 and 40. 9 for the two years respectively and the non-coverage of periodicals is as much as 8 and 13 as against the coverage figures of 5 and 8 respectively.

In the Field crop abstracts the percentage of coverage of Indian literature is 23. 5 and 34. 4 respectively for the two years concerned and the noncoverage of periodicals as a whole is 5 and 12 as against coverage figures of 7 and 10.

In the Animal breeding abstracts the percentage for the two years are 58. 3 and 55. 0 respectively and the non-coverage figures of periodicals are 8 and 11 as against coverage figures of 5 and 6.

In the Dairy science abstracts 86. 7 percent and 67. 6 percent are the coverages and the figures for periodicals not covered are 2 and 6 as against 5 and 9 periodicals that are actually covered in the two years.

TIME-LAG

The speed of reporting of Indian literature in the CAB services has been examined with reference to the entries analysed. The time-lag is calculated from the date of publication in the Bibliography. The date of individual issues as printed on the cover page has been taken into account in respect of the CAB services for reckoning the difference in time lag. It is expected that the Bibliography which is our checkpoint normally reports Indian literature within 1-2 months from the date of appearance of the periodicals. The Bibliography has been a monthly and the CAB services excepting the Dairy science abstracts which is a monthly are all either bi-monthly or quarterly. Moreover the CAB services are abstracting periodicals whereas the Bibliography is an indexing periodical. The comparison of speed of CAB services in relation to the Bibliography is not therefore equitable. The study does however provide an indication as to after how much time Indian literature gets disseminated to the outside world through international abstracting services like the CAB services. A summary of the findings is given in Table 1. Tables 8 to 13 provide detailed data on the time lag in reporting Indian literature in CAB services.

It is always normal to allow a time lag of six months for reporting literature in international abstracting periodicals but anything more requires attention. We find from the data that there is scope for improvement in this direction.

The Soils and fertilizers and Plant breeding abstracts have reported within a time lag of six months Indian literature of 1961 analysed in the study to the extent of 88. 0 percent and 72. 4 percent respectively. This may be regarded as quick reporting. As regards Indian literature of 1962, the Soils and fertilizers have covered within a time lag of six months 65 papers which comes to 57. 0 percent. The Dairy science abstracts has also done well in reporting the entries of the years 1961 and 1962 analyzed in the study within a time lag of six months to the extent of 77.0 percent and 69.6 percent respectively. In all other cases more than 50 percent of the entries analysed had not been reported within a time lag of six months.

Within a time lag of one year the six services have reported the entries analysed in the study of follows:

	1961 Percentage	1962 Percentage
Soils and fertilizers	100.0	92.4
Plant breeding abstracts	90.8	74.8
Horticultural abstracts	78.0	85.3
Field crop abstracts	65.0	68.3
Animal breeding abstracts	43.0	64.0
Dairy science abstracts	100.0	79.6

In international abstracting services a time lag of one year in reporting literature is not unusual.

The percentage of time lag of more than a year in the six services are as follows:

	1961 Percentage	1962 Percentage
Soils and fertilizers	-	7.6
Plant breeding abstracts	9.2	25.2
Horticultural abstracts	22.0	14.7
Field crop abstracts	35.0	31.7
Animal breeding abstracts	57.0	36.0
Dairy science abstracts	-	20.4

It may be considered as a case of delayed reporting if abstracting services report literature after a time lag of more than a year.

SCOPE FOR IMPROVEMENT

The findings of the study indicate that there is scope for improvement in the CAB abstracting services in the extent and speed of reporting of Indian literature. The Indian science abstracts (monthly) being published by the INSDOC since January 1965 may be of help to the CAB abstracting services in this direction. The Indian science abstracts aims at systematic and expeditious bibliographical control of scientific publications of India.
In addition to the contributions from periodicals, other publications like patents, standard specifications, reports, monographs, conference proceedings etc. are also covered in the Indian science abstracts. Each issue reports about 1,200 documents of which about 45 documents are from Botany, 40 from Zoology and 140 from Agriculture. The Indian science abstracts endeavours to report the literature within a time lag of three months after publication. It is expected that a national effort like this will serve as a valuable feeder service to the international abstracting and indexing services like the CAB services in noticing the Indian literature exhaustively and disseminating it expeditiously.

SUMMARY TABLE - 1

TIME-LAG IN REPORTING

CAB Abstracting service	Year	No. of entries selected in the Bibliography	No. of entries reported in the CAB abstracts	Difference in time-lag from the Bibliography Percentage of reporting in the total entries covered			
				upto 6 months	7 to 12 months	13 to 18 months	19 months onwards
Soils and fertilizers	1961	168	50	88.0	12.0	-	-
	1962	181	65	57.0	35.4	3.0	4.6
Plant breeding abstracts	1961	120	76	72.4	18.4	4.0	5.2
	1962	120	83	37.4	37.4	21.7	3.6
Horticultural abstracts	1961	56	18	28.0	50.0	-	22.0
	1962	83	34	20.6	64.7	11.7	3.0
Field crop abstracts	1961	85	20	20.0	45.0	25.0	10.0
	1962	119	41	-	68.3	29.3	2.4
Animal breeding abstracts	1961	36	21	-	43.0	38.0	19.0
	1962	71	39	31.0	33.0	26.0	10.0
Dairy science abstracts	1961	15	13	77.0	23.0	-	-
	1962	34	23	69.6	13.0	17.4	-

EXTENT OF REPORTING

CAB Abstracting service	Year	No. of entries selected in the Bibliography	No. of entries reported in the CAB abstracts	Percentage	No. of journals covered in the Bibliography	No. of journals covered in the CAB abstracts	No. of journals not covered in the CAB abstracts
Soils and fertilizers	1961	168	50	29.8	39	12	27
	1962	181	65	36.0	44	15	29
Plant breeding abstracts	1961	120	76	63.3	26	16	10
	1962	120	83	68.6	23	15	8
Horticultural abstracts	1961	56	18	32.1	13	5	8
	1962	83	34	40.9	21	8	13
Field crop abstracts	1961	85	20	23.5	12	7	5
	1962	119	41	34.4	22	10	12
Animal breeding abstracts	1961	36	21	58.3	13	5	8
	1962	71	39	55.0	17	6	11
Dairy science abstracts	1961	15	13	86.7	5	3	2
	1962	34	23	67.6	9	3	6

Note: A few journals covered in the CAB Services have been left out in the Bibliography.
The CAB Services could therefore notice a few other papers not reported by the Bibliography.

TABLE 2

SOILS AND FERTILIZERS

Serial No	Title of Indian Periodical	No. of entries selected in the Bibliography relating to the Soils and fertilizers		No. of entries reported in Soils and fertilizers		Extent of reporting	
		1961	1962	1961-63	1962-64	1961	1962
1	Agra Univ J Res Sci	-	1	-	1	-	A
2	Allahabad Fmr	1	7	X	2	X	D
3	Andhra agric J	9	7	X	1	X	E
4	Annu Rev biochem Res India	-	1	-	X	-	X
5	Bull bot Soc Saugar	1	-	X	-	X	-
6	Cocon Bull	2	1	X	X	X	X
7	Curr Sci	8	7	5	5	C	C
8	Gosamvardhana	-	1	-	X	-	X
9	Indian Agric	-	2	-	X	-	X
10	Indian Cocon J	3	3	1	X	D	X
11	Indian Coff	1	-	X	-	X	-
12	Indian Cott Gr Rev	7	1	4	1	C	A
13	Indian For	4	3	X	X	X	X
14	Indian J agric Sci	3	27	2	17	C	C
15	Indian J appl Chem	5	3	1	X	D	X
16	Indian J Ent	1	1	X	X	X	X
17	Indian J Genet	1	1	X	X	X	X
18	Indian J Microbiol	-	1	-	X	-	X
19	Indian J Plant Physiol	2	1	2	1	A	A
20	Indian J Pwr Riv Valley Dev	-	1	-	X	-	X
21	Indian J sugarcane Res Dev	12	6	X	X	X	X
22	Indian Oilseeds J	2	-	X	-	X	-
23	Indian Phytopath	-	1	-	1	-	A
24	Indian Sugar	3	4	X	X	X	X
25	Indian Tob	6	1	X	X	X	X
26	Int Comm Irrig Drain annu Bull	-	1	-	X	-	X
27	J Indian bot Soc	-	1	-	X	-	X
28	J Indian Inst Sci	-	2	-	1	-	C
29	J Indian Soc Soil Sci	29	22	27	19	B	B
30	J Inst Chem India	1	2	X	2	X	A
31	J Madras Univ	1	-	X	-	X	-
32	J Maharaja Saya ji Rao Univ	1	-	X	-	X	-
33	J Sci industr Res Sec B	-	2	-	X	-	X
34	J Sci industr Res Sec C	1	1	X	X	X	X
35	J Sci industr Res Sec D	-	1	-	X	-	X
36	J Sci Res Banaras Hindu Univ	1	2	X	X	X	X
37	J Soil Wat Conserv India	-	7	-	X	-	X
38	J Univ Poona Sci & Technol	1	1	X	X	X	X
39	J Univ Saugar Sec A	2	-	X	-	X	-
40	Kanpur agric Coll J	1	-	X	-	X	-
41	Madhya Bharati Pt 2 Sec A	2	-	X	-	X	-
42	Madras agric J	15	10	1	1	E	E
43	Mag Coll Agric Dharwar	-	8	-	X	-	X
44	Nagpur agric Coll Mag	-	5	-	X	-	X
45	Nagpur geogr J	1	-	X	-	X	-
46	Nat geogr J India	-	1	-	X	-	X
47	Proc annu Conv Sug Technol Ass	7	-	X	-	X	-
48	Proc nat Acad Sci India Sec A	17	19	4	10	E	C
49	Proc nat Acad Sci India Sec B	1	3	1	1	A	C
50	Proc nat Inst Sci Sec A	1	-	1	-	A	-
51	Proc Indian Acad Sci Sec B	-	2	-	2	-	A
52	Proc Silvicult Conf Dehra Dun	3	-	X	-	X	-
53	Proc Summ Sch Bot Darjeeling	-	1	-	X	-	X
54	Sci & Cult	5	6	1	X	E	X
55	Sugarcane Herald	5	-	X	-	X	-
56	Two & Bud	1	2	X	X	X	X
57	Vijn Parishad Anusand Patr	1	-	X	-	X	-
58	Vikram	-	1	-	X	-	X
	Total:	168	181	50	65		

Explanation of the symbols used in tables 2-7:

A : 100% coverage
B : 75% to 99% coverage
C : 50% to 74% coverage
D : 25% to 49% coverage
E : Below 25% coverage
X : No coverage.

TABLE 3

PLANT BREEDING ABSTRACTS

Serial No.	Title of Indian Periodical	No. of entries selected in the Bibliography relating to the Plant breeding abstracts		No. of entries reported in the Plant breeding abstracts		Extent of reporting	
		1961	1962	1961-63	1962-64	1961	1962
1	Agra Univ J Res Sci	2	-	2	-	A	-
2	Andhra agric J	9	7	4	5	D	C
3	Annu Rev biochem Res India	-	1	-	X	-	X
4	Arecanut J	2	-	1	-	C	-
5	Bull bot Survey India	-	1	-	X	-	X
6	Cocon Bull	1	-	1	-	A	-
7	Curr Sci	17	20	13	14	B	C
8	Hort Adv Saharanpur	2	-	X	-	X	-
9	Indian Agric-	-	3	-	1	-	D
10	Indian Cocon J	2	2	X	X	X	X
11	Indian Coff	1	-	1	-	A	-
12	Indian Cott Gr Rev	9	5	8	3	B	C
13	Indian Dairyman	1	-	X	-	X	-
14	Indian J agric Sci	2	6	1	4	C	C
15	Indian J Genet Suppl	-	9	-	8	-	B
16	Indian J Genet	25	17	22	15	B	B
17	Indian J Plant Physiol	1	-	1	-	A	-
18	Indian J Sugarcane Res Developm	2	1	X	X	X	X
19	Indian Oilseeds J	3	6	2	5	C	B
20	Indian Tob	2	-	X	-	X	-
21	J biol Sci Bombay	1	-	X	-	X	-
22	J Indian bot Soc	4	4	3	1	B	D
23	J sci Res Banaras Hindu Univ	1	1	X	X	X	X
24	Kanpur agric Coll J	2	-	X	-	X	-
25	Madras agric J	13	12	7	11	C	B
26	Nagpur agric Coll Mag	-	2	-	2	-	A
27	Poona agric Coll Mag	-	2	-	X	-	X
28	Proc Indian Acad Sci Sec B	2	2	2	2	A	A
29	Proc nat Acad Sci India Sec B	1	-	1	-	A	-
30	Proc nat Inst Sci Sec B	2	1	X	1	X	A
31	Proc Summer Sch Bot Darjeeling	-	4	-	1	-	D
32	Sci & Cult	12	13	7	9	C	C
33	Sugarcane Herald	-	1	-	X	-	X
34	Two & Bud	1	-	X	-	X	-
	Total	120	120	76	88		

TABLE 4

HORTICULTURAL ABSTRACTS

Serial No.	Title of Indian Periodical	No. of entries selected in the Bibliography relating to the Horticultural abstracts		No. of entries reported in the Horticultural abstracts		Extent of reporting	
		1961	1962	1961-63	1962-64	1961	1962
1	Agra Univ J Res Sci	1	-	X	-	X	-
2	Allahabad Fmr	3	7	X	1	X	E
3	Andhra agric J	12	8	X	X	X	X
4	Bihar agric Coll Mag	2	-	X	-	X	-
5	Curr Sci	9	9	7	2	B	E
6	Food Sci	-	9	-	9	-	A
7	Hindustan Antibiot Bull	-	1	-	X	-	X
8	Hort Adv Saharanpur	9	-	X	-	X	-
9	Indian Agric	-	2	-	2	-	A
10	Indian J agric Sci	1	5	1	4	A	B
11	Indian J Ent	2	4	X	X	X	X
12	Indian J Genet	-	1	-	X	-	X
13	Indian Phytopath	-	1	-	X	-	X
14	J Bombay nat Hist Soc	1	-	X	-	X	-
15	J Indian bot Soc	-	2	-	X	-	X
16	J sci industr Res	-	1	-	X	-	X
17	J sci Res Banaras Hindu Univ	5	3	4	2	B	C
18	Madras agric J	5	6	3	3	C	C
19	Mag Coll Agric Dharwar	-	1	-	X	-	X
20	Nagpur Agric Coll Mag	-	3	-	X	-	X
21	Poona agric Coll Mag	-	2	-	X	-	X
22	Proc nat Acad Sci India Sec B	-	3	-	X	-	X
23	Proc Summer Sch Bot Darjeeling	-	1	-	X	-	X
24	Sci & Cult	5	13	3	11	C	B
25	Thermometer	-	1	-	X	-	X
26	Vikram Sci	1	-	X	-	X	-
	Total	56	83	18	34		

TABLE 5

FIELD CROP ABSTRACTS

Serial No.	Title of Indian Periodical	No. of entries selected in the *Bibliography* relating to the *Field crop abstracts*		No. of entries reported in the *Field crop abstracts*		Extent of reporting	
		1961	1962	1961-63	1962-64	1961	1962
1	Allahabad Fmr	--	4	-	X	-	X
2	Andhra agric J	15	13	1	6	E	D
3	Bihar agric J	-	1	-	X	-	X
4	Curr Sci	4	11	-	7	-	C
5	Indian Cott Gr Rev	26	17	6	5	E	D
6	Indian Geogr	1	-	X	-	X	-
7	Indian J agric Sci	-	13	-	10	-	B
8	Indian J agric Sci Genet Breed Suppl	-	2	-	X	-	X
9	Indian J Genet	2	1	X	X	X	X
10	Indian J Microbiol	-	1	-	X	-	X
11	Indian J Plant Physiol	-	5	-	3	-	C
12	Indian Oilseeds J	4	2	2	1	C	C
13	J Indian bot Soc	1	4	1	X	A	X
14	J Indian Soc Soil Sci	1	3	1	1	A	D
15	J sci industr Res	-	1	-	X	-	X
16	J sci Res Banaras Hindu Univ	-	1	-	X	-	X
17	J Univ Poona	-	1	-	X	-	X
18	Kanpur agric J	1	-	X	-	X	-
19	Madras agric J	24	19	7	5	D	D
20	Mag Coll Agric Dharwar	-	5	-	X	-	X
21	Proc nat Acad Sci India Sec B	1	2	X	X	X	X
22	Proc nat Inst Sci Sec B	-	3	-	2	-	C
23	Proc Summer Sch Bot Darjeeling	-	3	-	X	-	X
24	Sci & Cult	5	7	2	1	B	E
	Total	85	119	20	41		

TABLE 6

ANIMAL BREEDING ABSTRACTS

Serial No.	Title of Indian Periodical	No. of entries selected in the *Bibliography* relating to the *Animal breeding abstracts*		No. of entries reported in the *Animal breding abstracts*		Extent of reporting	
		1961	1962	1962-64	1962-64	1961	1962
1	Allahabad Fmr	-	2	-	1	-	C
2	Agra Univ J Res Sci	1	-	1	-	A	-
3	Curr Sci	-	3	-	X	-	X
4	Gosamvardhana	-	2	-	X	-	X
5	Indian Bee J	1	1	X	X	X	X
6	Indian J Dairy Sci	10	9	9	6	B	C
7	Indian Genet	1	-	X	-	X	-
8	Indian J Physiol	1	2	X	X	X	X
9	Indian J Sericult	-	1	-	X	-	X
10	Indian J vet Sci	1	16	1	12	A	B
11	Indian Poult Gaz	1	1	X	X	X	X
12	Indian Silk J	2	-	X	-	X	-
13	Indian vet J	12	17	8	13	C	B
14	J anim Morph Physiol	2	3	2	3	A	A
15	J vet Anim Husb Res	-	6	-	4	-	C
16	Kanpur agric Coll Ann	1	-	X	-	X	-
17	Kerala Vet	-	4	-	X	-	X
18	Madras agric Coll Ann	-	1	-	X	-	X
19	Madras Vet Coll Ann	2	1	X	X	X	X
20	Madras Coll Agric Dharwar	-	1	-	X	-	X
21	Proc Indian Acad Sci Sec-B	-	1	-	X	-	X
22	Silk & Rayon	1	-	X	-	X	-
	Total	36	71	21	39		

TABLE 7

DAIRY SCIENCE ABSTRACTS

Serial No.	Title of Indian Periodical	No. of entries selected in the *Bibliography* relating to the *Dairy science abstracts*		No. of entries reported in the *Dairy science abstracts*		Extent of reporting	
		1961	1962	1961-63	1962-64	1961	1962
1	Agra Univ J Res Sci	1	-	1	-	A	-
2	Gosamvardhana	1	1	X	X	X	X
3	Indian Dairyman	-	1	-	X	-	X
4	Indian J Dairy Sci	10	15	10	15	A	A
5	Indian J vet Sci	-	1	-	1	-	A
6	Indian vet J	2	8	2	7	A	B
7	J vet Anim Husb Res	-	5	-	X	-	X
8	Kerala vet	-	1	-	X	-	X
9	Madras agric Coll Ann	-	1	-	X	-	X
10	Madras vet Coll Ann	1	-	X	-	X	-
11	Nagpur agric Coll Mag	-	1	-	X	-	X
	Total	15	34	13	23		

TABLE 8

SOILS AND FERTILISERS

	1961	1962
Total No. of entries selected in the Bibliography	168	181
Total No. of entries reported in the Soils and fertilizers	50	65
Extent of reporting (Percentage)	29.8	36
Difference in Time-lag from the Bibliography(in months)		
1	5	-
2	-	2
3	7	3
4	15	18
5	11	12
6	6	2
7	1	12
8	-	1
10	1	10
12	4	-
13	-	2
19	-	1
20	-	1
26	-	1
Total:	50	65
Percentage		
1- 6 months	88.0	57.0
7-12 months	12.0	35.4
13-18 months	-	3.0
19 months onwards	-	4.6

TABLE 9

PLANT BREEDING ABSTRACTS

	1961	1962
Total No. of entries selected in the Bibliography	120	120
Total No. of entries reported in the Plant breeding abstracts	76	88
Extent of reporting (Percentage)	63.3	68.6
Difference in Time-lag from the Bibliography (in months)		
1	11	-
2	2	-
3	8	1
4	20	4
5	18	21
6	6	5
7	1	7
8	7	8
9	3	2
10	-	2
11	3	11
12	-	1
13	-	1
15	-	10
16	-	2
17	3	1
18	-	4
19	-	2
20	1	-
21	2	-
22	1	-
27	-	1
Total:	76	83
Percentage		
1- 6 months	72.4	37.35
7-12 months	18.4	37.35
13-18 months	4.0	21.70
19 months onwards	5.2	3.60

TABLE 10

HORTICULTURAL ABSTRACTS

	1961	1962
Total No. of entries selected in the *Bibliography*	56	83
Total No. of entries reported in the *Horticultural abstracts*	18	34
Extent of reporting (Percentage)	32.14	40.96
Difference in Time-lag from the *Bibliography* (in months)		
5	2	2
6	3	5
7	7	9
8	1	3
9	1	1
12	-	9
13	-	1
14	-	2
18	-	1
24	2	-
28	1	-
31	-	1
34	1	-
Total:	18	34
Percentage		
1- 6 months	28.0	20.6
7-12 months	50.0	64.7
13-18 months	-	11.7
19 months onwards	22.0	3.0

TABLE 11

FIELD CROP ABSTRACTS

	1961	1962
Total No. of entries selected in the *Bibliography*	85	119
Total No. of entries reported in the *Field crop abstracts*	20	41
Extent of reporting (Percentage)	23.5	34.4
Difference in Time-lag from the *Bibliography* (in months)		
5	1	-
6	3	-
7	1	3
8	3	5
9	-	1
10	-	3
11	1	6
12	4	10
13	3	4
14	-	2
15	1	-
16	-	1
17	1	5
19	2	-
20	-	1
Total	20	41
Percentage		
1- 6 months	20.0	-
7-12 months	45.0	68.3
13-18 months	25.0	29.3
19 months onwards	10.0	2.4

TABLE 12

ANIMAL BREEDING ABSTRACTS

	1961	1962
Total No. of entries selected in the *Bibliography*	36	71
Total No. of entries reported in the *Animal breeding abstracts*	21	39
Extent of reporting (Percentage)	58. 3	55
Difference in Time-lag from the *Bibliography* (in months)		
5	-	4
6	-	8
7	3	1
9	-	2
10	5	6
11	-	2
12	1	2
13	2	4
14	2	-
15	2	3
16	-	3
17	2	-
19	2	-
21	2	-
26	-	4
Total:	21	39
Percentage		
1- 6 months	-	31. 0
7-12 months	43. 0	33. 0
13-18 months	38. 0	26. 0
19 months onwards	19. 0	10. 0

TABLE 13

DAIRY SCIENCE ABSTRACTS

	1961	1962
Total No. of entries selected in the *Bibliography*	15	34
Total No. of entries reported in the *Dairy science abstracts*	13	23
Extent of reporting (Percentage)	86. 7	67. 6
Difference in Time-lag from the *Bibliography* (in months)		
2	2	3
3	8	5
4	-	4
5	-	4
8	1	1
9	-	2
10	1	-
12	1	-
13	-	1
14	-	1
15	-	2
Total:	13	23
Percentage		
1- 6 months	77	69.9
7-12 months	23	13. 0
13-18 months	-	17. 4
19 months onwards	-	-

CURRENT DOCUMENTATION LITERATURE

CDL is an index to current periodical literature in Library Science, Documentation, Reprography and Translation. This index is mainly intended to serve the professional needs of librarians, documentalists and students. An attempt is made to minutely classify the articles. This experiment, we hope, will throw some light on the many problems of library classification and eventually lead to acceptable solutions.

This issue carries 444 entries of original and informative articles published currently in periodicals in the English, some of the other European, Japanese, and Indian languages totalling 51.

The arrangement of entries is according to the Colon Classification ed 6, 1963, supplemented by the tentative depth schedules for classification, cataloguing and bibliography published earlier in the Annals, and for book science published recently in Library Science with a slant to Documentation. Slight changes have been made in the use of these schedules. An attempt has been made to give coextensive class numbers to the extent possible. It is proposed, however, to develop finally, elaborate schedules for this purpose, on the basis of our experience in the compilation of this list.

We earnestly hope this feature in the Annals will be received well by the subscribers. Any suggestions to improve the quality of the index will be very welcome and thankfully acknowledged.

Compiled by:

ARORA G K
GUHA B
KAMALA PADMAGIRISWARAN
RAJAN T N

LIST OF PERIODICALS COVERED IN THIS ISSUE

Note: Volume and issue numbers have been mentioned in each case.

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Gekkan Jicst [Gekkan Jicst]	7(12), 8(1 to 3)
Granthagar [Granthagar]	14(11), 15(1)
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Journal of Education for Librarianship [J Educ Librnship]	5(3)
Journal of Metals Newyork [J Metals N Y]	17(1)
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annals of library science and documentation

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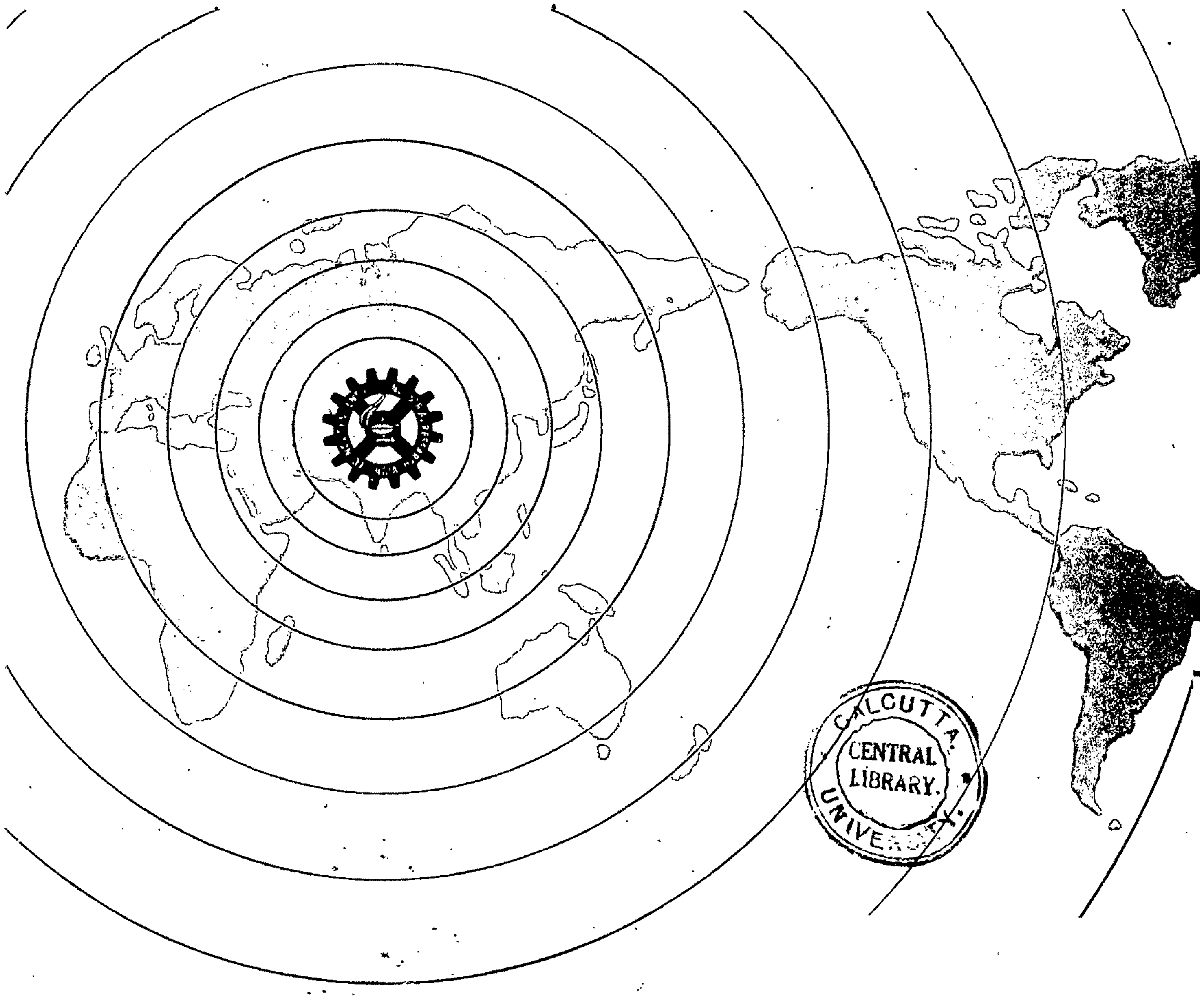
Edited, printed and published by S. Parthasarathy at Insdoc, Hillside Road, Delhi 12.



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annals of library science and documentation

INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE DELHI - 12

VOL 12 NO 3 SEPTEMBER 1965

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Annals of Library Science and Documentation is a Medium for publishing original contributions in the field of library classification, cataloguing, bibliographic organisation, documentation techniques, mechanical methods of documentation, bibliographic standardisation, etc.

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of the very efficient information services in the country, reported on the Delhi Public Library and its work. It was highly exciting reading, exceedingly pugilistic in its approach, full of roistering fun at the expense of the remarkable experiment but, alas! very unhelpful in every way! Perhaps it was well that this red-blooded censoriousness was diverted away from librarianship to other, and presumably higher executive responsibilities! There are no purple patches of reading in this report but every page of it is instinct with an idealism unblunted by years of work and a gentleness which commands our respect. There are certain major recommendations in the report with which we find it difficult to agree, but even our disagreement is more one of emphasis rather than any sharp difference of opinion. We should like to extend our congratulations to Mr. Carl White for having accomplished his task so well in such a short time and with such graciousness. Now for the report itself.

FOREWORD & AUTHORSHIP

The report is entitled 'A Survey of the University of Delhi Library', and the title page tells us that Mr. Carl M. White, Programme Specialist in Library Administration for the Ford Foundation, carried out the survey in cooperation with the staff of the Planning Unit of the University of Delhi, which was published in October of the year 1965. The report consists of 169 pages, a preliminary 16 pages taken up by the contents, the tables and the letter of transmittal. Towards the end of the volume are several figures meant to elucidate several aspects of the report. Bound in thin board and in octavo format, it is well printed, considering the short time in which it was brought out.

THE CONTENTS & THE SCOPE OF THE SURVEY

The historical development of the library, the significant context of the library in the capital city of India with its rich potential favourable to the development of the university library, the nature of the book collections, the services the library gives to the clientele, the administrative and financial implications of the university library and its place in library cooperation constitute the main topics of the report. A whole chapter is given to the summary of recommendations.

Dr. Carl White has culled very tellingly from many documents pertaining to education and we should like to dwell somewhat on the first chapter which deals with the university library in perspective. He lays down the guidelines of the report in simple, precise language: "The purpose of this report is 1) to view the library in its setting, 2) to assess the effectiveness with which its responsibilities are being met; 3) to suggest measures for improving and 4) to identify problems, special problems of longer range which require further study".

THE MAGNITUDE OF THE PROBLEM VIS-A-VIS AVAILABLE PERSONNEL

About 30,000 students and 1800 teachers have to depend upon the resources of the University of Delhi Library, and 35 college libraries. 2,30,000 volumes represent the strength of the University Library out of which a 168,263 are housed in the main library building. This collection is to be serviced and maintained by a staff of a 100 people with a 25% leaven of professional librarians.

HISTORICAL DEVELOPMENT: GWYER & RANGANATHAN

The present library building, its collection of books and its present staff has behind it a perspective of nearly 45 years. Sir Maurice Gwyer was the seminal influence which sought to transform "the disgrace to the university" (Sir Maurice's description of the university library which he inherited as Vice-Chancellor) into a rich library. "In 1942 he brought to Delhi India's foremost librarian, Dr. S.R. Ranganathan, to recommend how to put the library on better professional footing ... Dr. Ranganathan joined in making these improvised accommodations inviting and comfortable, recommended strengthening the collection, recommended adoption of the Colon Classification, and went on to focus attention for the first time on the relation of high grade personnel to high grade library service. He proposed increasing the size and calibre of the staff, his crucial recommendation being to place a professional trained librarian in charge by 1943-44".

PERIOD OF LANGUISHMENT

After this initial bustle on the part of Sir Maurice the University Library settled down to a condition where the library is regarded "not as an essential part of teaching equipment but merely as a more or less useless conventional accessory". No serious attention was paid to the "enthusiastically drafted proposals of the first professional librarian the University had, for an integrated library programme adapted to the requirements of the university as a whole" as Mr. White well puts it. "At any rate critically improved plans for rational organisation and expansion of library services gathered dust.... when carefully examined.... the records suggest that the Ranganathan survey and the appointment of a librarian, useful as they were, failed to change appreciably the low place held by the library in the academic community's scale of values."

REASON FOR STAGNATION: PASSIVE EDUCATIONAL PROCESS

Carl White very shrewdly puts his finger on the real reason for the stagnation of the library. He quotes effectively from a Committee Report on Examination Reform, appointed by the University Grants Commission: "During the year the typical student spends less than an hour a day on study outside class attendance ... students do not see and need additional study time during the regular year since the major emphasis is on getting notes from the lectures and checking these notes against a standard text book. The students are also convinced that they will be held for a memorised version of the subject and that the attempt to learn this material too early is wasted since it cannot be retained until examination time." In other words the library will only be as good as the system of education prevailing. "What was wrong with university and school education? The desolate bookishness of a mere academic life". The story is told of a professor who advised a member of his family to prepare for an examination and suggested a list of books to the young man to consult in the library. The student however did extensive detective work to find out who was to prepare the examination and adapted his method of study to his findings. The strategy is said to have succeeded brilliantly!

FRIGID EDUCATIONAL ATTITUDES

Dr. White very skilfully inter-weaves into his study of the perspective of the Delhi University Library an analysis of the frigid educational attitudes which prevailed in the thirties and the forties apropos a library in a university or a college. The educational process, he says, "held that the essentials of academic achievement are authoritative lectures supported by a well chosen list of prescribed readings followed with examinations by outsiders who test the degree to which students have absorbed the information contained in lectures and required readings. Assuming that the student follows the lectures closely and can buy the prescribed texts the library, for him, amounts to an external accessory to the learning process— like a badge. If it is a great library, it may be a badge of honour and pride, but it would be unjustifiable to finance such a dispensable accessory by calling it the heart of a university".

LIBRARY, THE HEART OF THE UNIVERSITY

A Vice-Chancellor in an address is said to have described a university as a community where scholars and teachers are the head, the students its body and the library its heart. Dr. White himself in his letter of transmittal describes the library as being inter-connected with all live academic programmes throughout the university and goes on to say that the internal working of a large library are interconnected. Touching one routine is like touching a part of the internal mechanism of a clock; the other parts are also effective. Dr. White asks the question "has the 43 year investment in the university libraries which has risen so rapidly during the last ten years made them the heart of the University of Delhi? and he answers "not yet, Ratan Tata (he refers to the Ratan Tata Departmental Library in Economics, Political Science and other background material) being no doubt an exception".

ENTER C.D. DESHMUKH AND THE U.G.C.

During the forty-three year period of its development, apart from the Maurice Gwyer initiative which petered out for want of nursing, was the initiative of another man of equal vision and understanding, Dr. C. D. Deshmukh, who as Chairman of the University Grants Commission decided that "the total planning of higher education would be brought into balance by giving universities incentive to help those libraries catch up which were lagging behind...... it was a decision of unprecedented importance to the advancement of Indian university libraries for it opened the way for a wide range of imaginatively conceived proposals to be accorded high priority.

Universities were free, for example to petition for aid to enrich their book collection or to reinforce the staff or to improve physical condition".

U.G.C. COMMITTEE ON LIBRARIES AND THE STAFF FORMULA

The Advisory Committee appointed by the U. G. C. under the Chairmanship of Dr. Ranganathan evolved a staff formula, the utilisation of which formula by the Delhi University resulted in a dramatic 60% increase in manpower. The University also adopted the recommended pay scales which placed the salaries for professional librarians on the same footing with teachers and used the higher scales both to make new appointments and raise the salaries of the existing staff. Dr. White observes as follows: "Quick reading of the final reports could suggest that the Committee intended to recommend the use of quantitative yardstick to decide more or less mechanically complicated questions such as staff needs which required mature judgement based quite as much on qualitative as on quantitative considerations. Closer study shows that flexibility of this sort was meant to be taken for granted. Quantitative formulae, it appears, were intended to serve as first aids to professional judgement, as general 'norms' which do not rule qualitative standards out of consideration. The report recommends .... that 'each university will have to adopt its own policy in the context of its conditions'. The U.G.C. can only communicate general principles".

MONEY & MORE MONEY IS NOT THE ANSWER

He also refers in the chapter to the prevailing illusion that "there is nothing the matter with the Indian libraries which more money will not remedy". He goes on to say that "when commissions like the Calcutta University Commission in 1919 complained of the neglect of the library, they were not merely referring to lack of money but "were laying hold of something deeper -- the attitudes and habits which governed the educational practices of that day; and they were deploring the neglect by teachers of the rich potential of the library as a teaching instrument. No amount of material support will of itself change the neglect which springs from recesses so deep".

And one of the very true and significant remarks he makes in this opening chapter is that "much of the drive to create adequate library facilities for the University of Delhi has come from men who were themselves not teachers" but he is careful enough to note that in 1950 the Delhi University Teachers Association submitted a memorandum to the Vice-Chancellor a reasoned plea for more aggressive library development and the most telling sentence of all is "the hard fact to be faced is that the University of Delhi inherited an educational tradition which treated the library as a conventional but useless accessory".

All this loud thinking leads Dr. White to his basic premise that library service of high quality is the heart of an academic programme of vision and quality.

THE CONTEXT OF THE VIRILE YOUNG METROPOLIS RISING OVER INDIA & ASIA, POPULOUS, LITERATE & SWARMING WITH EDUCATIONAL INSTITUTIONS

The case that Dr. Whites makes in his next chapter about the remarkable atmosphere prevailing in Delhi as being suitable for a burgeoning University Library Service of a high order, could be taken as pertaining to most of the highly developed regional capitals in the country. For example, he says Delhi has not only the greatest density; it is also the most literate. He then refers to the 296 organisations in the Delhi territory which conduct formal programmes of higher education. Then he says that Delhi provides the best soil for the growth of a great university to be found anywhere in the nation. Bombay, Calcutta and Madras would equally qualify as these parameters would apply to them as well. He himself remarks on the lack of libraries, museums and other organisations found in the other three great cities of India, but feels that the "virile young metropolis rising over India and Asia" has a great future. We are happy to say 'Amen'!

INCREASES IN ADVANCED STUDY & IN STUDENT AND TEACHER NUMBERS

Apart from the political significance of Delhi he goes on to point out that Delhi was given five centres of advanced study while the three older universities were given three each and the three other central universities one each. Since independence there has been a 784% increase in the students. It is interesting to note that the independence year had 80 students enrolled for their Ph. D., and last year found 852 students so enrolled. The master of science students went up from 60 to 200, the master of arts students went up from 332 to 2,282, advanced professional students learning medicine, technology, education, law, business management, etc. went up from 725 to nearly 3,000 and the normal complement of honours and B.Sc. students from 577 to 7,005. It is interesting to find that the number of university teachers have gone up 380% in the same period. Against 331 teachers in 1948-49, there are nearly 1816 teachers now. The professorial staff has been nearly quadrupled. The "readers" staff has registered an increase, double that of the professorial staff. The lecturers have nearly trebled. This refers only to university appointed teachers. The college teachers in the campus colleges have multiplied ten times over and in the non-campus colleges five times over. This analysis representing an 840% increase in students in the period following independence has very significant implications of high grade library service. The ratio of teachers to students of course has been constant all the years through but whether the development of senior staff has fully kept pace with the rapid shift of emphasis of specialisation of research needs further analysis. One of the most important features in the analysis of figures pertaining to the students is the one that tells us that 23% of the students come from outside Delhi and there are more than 400 students from abroad. As Mr. White puts it: "Young people from Yugoslavia and the Fiji Islands meet and come to know Cambodian, Japanese and Western Europeans".

THE BROAD SOCIAL RESPONSIBILITIES OF DELHI UNIVERSITY

What does all this lead Mr. White to conclude? He says that because the University of Delhi has special responsibilities for reasons of origin and location, the university must undertake a library programme attuned both to its education and broad social responsibilities. But what should be the nature of this programme and the following words of Mr. White are memorable in this connection: "Given teachers who teach with books and librarians who can and will cooperate with them in converting the library into an intellectual workshop, a handful of sensitively chosen books may work wonders in the lives of the students. Without such a staff, the most luxurious building or extensive book collection may have little effect on their lives". These words are pregnant with meaning and from them spring one of his main recommendations which is to enrich the library staff with senior personnel of proper mental attitudes and academic distinction to service the material to the vast and varied clientele described above.

THE BOOK-COLLECTIONS IN THE DELHI UNIVERSITY

The book collection in the Delhi University, apart from the 2,30,000 volumes in the university library, are dispersed in 35 colleges which spend, nearly Rs 19 lakhs p per year on libraries. Of this, six and odd lakhs of books and periodicals costs them Rs 5,1/2 lakhs, the rest of the money being spent on other operating costs and binding. That means that the total book wealth in numbers of the university and college libraries together comes to very much less than a million volumes. Compared to the holdings of university libraries of international repute, the volume of holdings of the Delhi University Library is indeed disappointingly small considering the clientele it has to serve. The figures from America for university libraries are inhibitingly large. Harvard with its nearly seven million, Yale with its four and half million, Columbia with its three million and above, and Berkeley with its near three million are figures indicative of a specially burgeoning economic and political context. We do not have to measure ourselves against them. In Europe, the Sorbonne has got a 1.50 million volumes, London has 800,000 volumes, nearer home, Calcutta has nearly 400,000 volumes. Of course in the European figures it must be noted that the University of Paris has 4.5 million volumes and that includes the Sorbonne collection. Whatever the standard of measurement, this much is clear that the book collections of the Delhi University Library in spite of their phenomenal rate of growth between 1949 and 1959 is still a long way from the required standards of service.

PROFESSIONAL OPINION ON THE ADEQUACY OF THE COLLECTION

One of the tests applied by Mr. White for judging the adequacy of the collection was to ask the Heads of the Departments of the University, their opinion, about the collection, and the questions asked were clear and straightforward. Of the 23 heads of departments, 21 of them seemed to have felt that the collection was not strong enough to support the research of professors, readers, teachers and research of post-graduate students; 15 of them felt that it was strong enough to support just post-graduate instruction and under-graduate honours students; 13 of them felt that the collection was strong enough to support the instruction of undergraduate students.

ESTABLISHMENT OF NEW FACULTIES & LIBRARY RESOURCES NOT RELATED

A very strong and relevant opinion of one departmental head was that faculties are established in the university without any calculation of the library resources needed to sustain them at a proper level of efficiency. Taking all this into consideration, Mr. White has a very basic recommendation to make and that is "that the university should adopt the practice of examining with the aid of the librarian, the library implications of a proposed educational programme as one of the steps necessary for determining whether the proposal is to be approved". One of the great difficulties of the use of the university library is that people come to this university from long distances and they cannot afford to sit in the library late into the night or early in the mornings for study. This obliges the library to loan material for home carrying and therefore a very strong case seems to be made out by Mr. White for a special library fund to duplicate titles adjudged to be necessary to provide adequate library support for the academic activities of the university.

INCREASE IN THE FIELDS OF EXAMINATION NOT BACKED UP BY SUITABLE ACQUISITION

One of the startling facts about the library in the university is the increase in the number of fields in which students are allowed to take examinations. From 437 in 1949, to 1068 in 1964, is a big jump in the number of fields for examination. The implication is that this jump should be backed up by material in the library, but an actual examination tells us that this is not so. Mr. White observes with some humour; "The wise builder however is not satisfied to start a 500 ft. bridge and leave the last 50 ft. unfinished". This will mean that there must be faculty cooperation in book selection. A sampling was taken from a cross-section of 53 professors and 139 students and they were asked whether their research had been adversely affected by lack of materials, service or accommodation. To this, 38 of them said that their work had been adversely affected and when asked whether they found the book collection strong enough to support their work, 93 of them said that it was not.

TESTS APPLIED TO JUDGE THE ADEQUACY OF THE COLLECTION

A survey of the reference material in the university library was made on the basis of checking up what material there has been on the shelves, with the reference tools cited in Winchell's Guide to Reference Books. Though it is true that every item in Winchell's list is not needed in Delhi and there are tools of information on Southern Asia not listed in Winchell, even allowing for these limitations, the result of the survey showed that in only two areas, namely, in science and library science, was there a 20% holding of the reference tools listed.

Even as Winchell's Guide served for reference material, Ulrich's Periodicals Directory served as a check tool for periodicals. The results of the checking show that the departments have access to less than 50% of the journals listed as essential and only 34% of the journals listed as desirable. The depressing conclusion is that the university is now receiving less than half the number of journals which scholars consider necessary for their work. Mr. White's recommendation based on these findings is that "all journals which are essential for instruction and research should be obtained and the library should accept responsibility towards building a rounded collection of research material for India as a whole", sharing the task with major research libraries.

AREAS OF SPECIALIZATION MUST BE BACKED BY LIBRARY RESOURCES

The University has identified 134 areas of specialisation. Essential literature, say the scholars, must be provided in these areas. If such a programme has to be undertaken, a very systematic method of accession should be evolved. A very aggressive policy of collecting source material must be followed. Acquisition of manuscripts and rare books, encouraging the deposit of special collections in the library, attempts to develop an oral history project by recorded interviews on tapes, and a very thorough system for the preservation of the university archives -- all this should be taken on hand.

GOVERNMENT OF THE LIBRARY

Among the key paragraphs in the report the one which we are about to cite in full because of its importance is contained in the chapter on the Government of the Library. The entire health of the library service depends upon the recommendations that spring from the analysis contained in this paragraph which states the very confused situation at present about the place of the university library and its authority in the structure of university government. Here is the paragraph: "The Library is not recognized as one of the Authorities of the University. Omission from the Statutes of any definition of its scope and nature leaves a sort of no-man's land of uncertainty and lack of order. The Library purchases books for some departments, but not for others, the action depending on person-to-person agreements, not on policy established at the University level. When books are purchased, it may or may not be clear whether they are to be treated as library or departmental "property". In some cases, the Main Library Staff have prepared cards for books which the Department is to "control", but paralysis sets in there. The cards are not filed in the public catalogue for lack of University guidance on whether or not these books "belong" to the Department or are to be used by other Departments too. Approved bills for books are passed to the University for Payment sometimes by the Librarian, sometimes by the Department. There is confusion on whether the intent of book funds allocated to buy books in a subject field is to subsidize work in that field only or to utilize expertise in all subjects to build up, in the act of supporting the current generation of scholars, well-rounded collections in all subjects which will serve present and future generations of scholars as well. There is no policy on how and when new departmental libraries are to be created and Table 18 shows no evidence of orderly government in controlling the ones already in existence." We have underlined certain sentences.

LEGAL TITLE TO ALL MATERIALS

The most important recommendation arising out of this situation is that the university library should be defined as the authority which has legal title to all materials acquired. The other equally important recommendation is to treat all facilities, services and staff as comprising, regardless of physical location, a single library system, and delegate responsibility for administering the system to a properly qualified librarian. The five other recommendations that spring from this situation deal with identifying all material as one of two categories, either as permanent equipment of departments of study, or as expendable material in the way of office supplies and dictionaries; assertion of university ownership of all acquired material; establishment of bibliographical control over all such material with responsibility for proper maintenance; avoidance of duplication of facilities and staff by separate physical location of separate libraries; intimate cooperation between departmental staff and the chief librarian of the university.

The high academic rank recommended to the post of the librarian is a natural corollary of these recommendations.

RESTRICTIVE PRACTICES LIMITING THE USE OF DEPARTMENTAL COLLECTION

One of the most vicious practices in many university libraries has been very firmly commented upon and that is, that a book bought by a department is still the sole property of the department and the users of that department, whether staff or students, and will not be available to others. This is an indefensible mental attitude and therefore gives rise to the very telling recommendation that "restrictive practices limiting the use of the books to members of a single department should be abolished, though it is recognised that a book purchased for a department and kept in the department may not be released for general use when it is being actually used in the department".

COMMITTEE PATTERN OF LIBRARY GOVERNMENT

Another very very basic mental attitude which so far governs the administration of libraries in many universities is the committee pattern of library government.

Prof. White humourously remarks: "The Irish elk is extinct because the horns which it had developed for protection became too cumbersome for survival". Obviously enough the horns of the elk in this case is the committee pattern which, though suited to pioneer conditions when universities were small and closely knit, also, devised as a protection against an incompetent librarian, is no longer valid. Highly trained librarians are available and the chief librarian should be vested with the powers of management now belonging to a library committee. Even as the head of the department is directly answerable to the Vice-Chancellor for all matters academic and administrative, the librarian also should be answerable directly to the Vice-Chancellor. Staff appointments should also be the responsibility of selection committees in accordance with procedure followed in other academic departments. Budget preparation should also be the responsibility of the librarian. The Library Committee should be largely advisory if there is to be such a committee and the librarian appointed to direct the libraries of the university not only should be accorded grade and academic rank assuring him permanent security, but should be made on a term basis renewable by mutual consent. (The rider to this last recommendation exempts the terms of appointment governing the present librarian). A very happy suggestion is that the university's chief librarian should compile a report which is not only meant for domestic consumption within the University but also available to the interested citizens of India.

NEED FOR A UNIFIED SYSTEM

A more enlightened and modern approach to the problems of departmental libraries in the university has been taken in this report. Very rightly it is said that independently administered faculty and departmental libraries belong to a period when faculties and enrolment was small and when the demand of books was limited. All over the world in all universities "the wind of change" is in the direction of a unified system which gives scope and encouragement to the enterprise of a librarian of marked ability. Prof. White very rightly observes: "It is worth observing that of all universities which have made these adjustments not one, as far as I am aware, has ever reversed itself and come back to independently managed libraries. The greatest good of the greatest number can best be served by encouraging the university to assert its ownership of the resources which it accumulates at the nation's expense and delegate to a professional in whom the university has full confidence, the responsibility for managing them in the common interest". These are indeed memorable words and very much in accordance with enlightened thinking all over the world. The rest of the report goes into problems of university administration and concerns itself with the details about the library staff required in accordance with the basic principles stated earlier in the report about the resources of a university library being connected intimately with areas of specialised study and educational programmes undertaken by the university. We need not concern ourselves with these details at the moment because whether the university librarian should have two, three, four or five senior people to assist him depends upon the realities of every university and we are sure the authorities of the Delhi University Library will give due weight to the very conscientious analysis of staff requirements made by Prof. White with which we are in broad agreement.

PROBLEM OF DEPARTMENTAL LIBRARIES

But what is most lively in this chapter on library administration is the discussion on departmental libraries. Reference is made to a cleavage in campus opinion on library policy as regards departmental libraries, and it is stated that this cleavage is more implicit than overt. This problem is age-old. Every professor wants to have all his material at his elbow and wants to consider the main university library as a dormitory for obsolete material. He would like space for reading in his own department and all the viable books and periodicals to be kept within his own department. Each department should have its own library open from 9 a.m. to 9 p.m. and in the interests of security and holding down of operating costs within departmental libraries could be locked, with the porter in charge of the keys, and with the descretion to admit any one at any time! Outsiders not belonging to the department should use these facilities only on a reference basis. Of course the cataloguing should be done by the main library staff, the departments being only responsible for security of materials and accessibility.

The main library exists to fill a sort of a vacuum. Another view was that departmental libraries should be built up as also the main library. The University Grants Commission is at the moment endorsing this policy of double development.

Prof. White has paid the greatest amount of thought to this problem. He has discussed this at length with many departmental heads. The University Grants Commission in its 1962 circular definitely said that "wherever this facility does not exist, the formation of departmental libraries was desirable. The model of university library service which surrounds a main library with departmental libraries, one for each department, insures each department maximum convenience, and the tentative action of the UGC obviously had this commendable end in view; but it is regrettably, the high priced model. The reason lies in the economics of fragmenting a library system..." The duplication of material, as revealed on the subject of economics between the Ratan Tata Library and the main library is considered desirable and necessary and the extra cost is written off as part of the price necessary to maintain a separate facility. The maintenance of a second set of hours of opening the year round adds to unit costs of staff. In short, a first principle in the economics of decentralisation is this: Each separate library, however necessarily desirable, boosts total library costs. The time taken by the departmental staff for supervision of library collection is also a matter adding to the costs. Multiplication of libraries produce units too small for space to be put to economical use. Six departmental libraries in Delhi occupy 8,145 sq. ft. compared with the 8,160 sq. ft. occupied by the two big reading rooms in the main library which latter are used in much heavier fashion. These small units do not provide ample space for books, readers and work space for the staff as good standards of library service require. The excellent example of the University of Chicago is cited where even with their tremendous resources, they tried to make departmental libraries self-sufficient. Even for them the cost proved so prohibitive that they had to abandon it. The same happened in the University of California. They first approved plans for providing departmental libraries and they found that the arrangements broke down and had to be abandoned. On the basis of this disillusioning experience the University of California has laid down a general policy that all university owned library facilities shall be under the administrative jurisdiction of the librarian. Proposal to create or continue libraries independent of this jurisdiction will be only considered when exceptional and compelling reasons exist and shall require the approval of the chief legal administrative officer and the President. After having analysed this situation thoroughly by examining statistics and by talking to departmental heads, professors, lecturers, students and the rest of them that had any relevance to the situation, Dr. White very correctly recommends that a consultant on library buildings be retained to make a special analysis of how to relate present use of space to long range building plans.

A SEPARATE SCIENCE LIBRARY

So far the report has been smooth going, but suddenly we are jolted by a recommendation which seems to be in the nature of a desperate remedy. Finding many departmental heads very intransigent in this respect, faced with the tentative support given to the promotion of departmental libraries by the UGC, perplexed by the widespread campus of the Delhi University which has "growed like Topsy", Prof. White seems to throw the towel in, and recommends the creation of a science library to serve the departments which constitute the faculty of science. He recommends that the collections maintained by these departments and the related material in the main library be used to form the nucleus of a new library. He also recommends the appointment of a science librarian of outstanding ability, and throws in a new building to house the science library for good measure. Of course, he says that the recommendation should be reviewed in the light of the findings of a study to be conducted by a librarian whose training and practical experience will stand him in good stead. But even so the scope he determines for this new science library is that it should be of national importance. 32,000 and odd sq. ft. of space costing Rs 8 1/2 lakhs, air-conditioning costing Rs 1.50 lakhs, operating cost of Rs 40,000 to 50,000 rupees per year and an initial storage of 100,000 volumes with a staff of fifteen people to manage it, seems to be his estimate in personnel and finance for this new science library. The chart that he gives on page 100 not only makes space for the science library as part of the set up of the university library system but again makes provision for departmental libraries and collections. I am afraid this does not make sense to us. The entire recommendations purport to be a development along divisional lines. The chart does not say so. The recommendation for the science library as apart from the humanities library hits the concept of a rounded education in a university in the solar plexus. Very soon we shall have this remarkable picture of a young man getting into a university and having to do only with the building either dedicated to the sciences or to the humanities. One can understand the planning of a library with stack ramifications following the standard patterns set by a classification scheme with reference collections and reading rooms allowing for use by varied disciplines. The very great danger of a science library building as apart from humanities library building is the segregation of the students both during study hours and in working hours. There is a certain intangible but at the same time profound benefit to be derived from the mixing of students in the various disciplines round the study tables in a library or in the lobbies or corridors of the library resulting in very rich consequences. As it is one of the basic objections to departmental libraries is that the students become so completely involved in their microcosms of subject disciplines that putting a departmental library next to their laboratories, would further promote this insularity. At least during the formative years of the mind it is very necessary that the campus should not become a cellular structure. Cross-fertilisation of minds is just not a phrase, open access is not just book alignment, economic in its implication of fetch and carry staff. Formal education in the class rooms and in the laboratories have about them something very nagging and constraining. The library today is the one great power for involuntary and therefore more effective education of the young. Phrases like *explosion of scientific literature, plethora of publications, confusion of minds by the welter of material before them,* should not lead us to the extreme of subject regimentation in the planning of library facilities.

NO NEED FOR PHYSICAL DICHOTOMY

The rounded concept of a plenary university library with its large reading rooms and reference shelves stocked with material from the varied disciplines is not in any way antagonistic to the extensions of well-planned modern stak areas shot through with reference spaces for reading. Let not any physical dichotomy further deteriorate a situation in the modern world where emphasis on scientific study to the exclusion of humanistic involvement is making the world a difficult place to live in.

Frankly we do not understand that part of Prof. White's report which raises a number of ghosts without really effectively laying them. We are entirely in sympathy with his difficulties in finding an effective solution to this departmental library versus the main library problem, but we do feel that the way of solving it is not by the creation of a new science library under the charge of a science librarian. In our opinion there is no such creature as a science librarian or a humanities librarian. If disciplines are certainly so varied as modern practice seems to indicate, there cannot be any particular individual just because he has the discipline of some ramification of the sciences, who can call himself a science librarian able to administer the vast complex of a science library. Library education today, fortunately in the realms of documentation and in library science, brings this out clearly that the students of the professional course should be educated in the mental attitudes of servicing and disciplining material without being expected to be encyclopaedic in the knowledge of either the humanities or of the sciences.

We were very anxious to publish along with this review of the report a picture of Dr. Carl White and all our efforts could not produce a photograph for use, but on second thoughts we feel that the better picture of Dr. White is the one that shapes itself out from the style and language of the survey he has made. Thoughtful, gentle, eager to listen to the other man's point of view, with a keen eye for the realities of the context in which he is functioning, and an idealism which years of tough-going in various responsibilities has not blunted -- all these are the happy lineaments of a very gracious portrait. For all his gentleness and eagerness to understand, Dr. White is firm and uncompromising where basic values are concerned.

26th November 1965
New Delhi

B. S. Kesavan

APPLICATION OF COMPUTERS TO LIBRARY WORK

G W HILL

C.S.I.R.O.
Melbourne, Australia

Discusses the possibilities of using modern computing equipment in library and documentation work in Australia. It is pointed out that machine retrieval depends to a large extent on an efficient indexing system. In this context the findings of the Cranfield Project are discussed. Some of the machine produced indexes are also discussed and their possible improvements by human interaction are also proposed.

1 INTRODUCTION

Lagging some years behind major countries in investment in technology, Australia is currently in a phase of rapidly expanding its installation of computing equipment. The time lag has the advantage that mistakes of pioneers need not be repeated, but carries the disadvantage that a comparable body of local experience has not been built up to support development, and both factors are relevant to the application of computers to library work in Australia.

Australia has the opportunity to avoid the breakdown of communication between over-optimistic computer retrievalists and the reservoirs of experience of professional librarianship, which marred the early stages of library computing overseas. It must be conceded that computers are well adapted to the repetitive clerical work involved in achieving many objectives of professional librarianship. However, two themes underlie the consideration of computer applications outlined in this paper. Firstly, even the most "obviously clerical" library operations embody conventions based on decades of experience in libraries and, secondly, even the more "intellectual" aspects of librarianship can profit by exploiting the clerical capability of computers.

In briefly touching on the Australian scene, it will not be possible to do justice to many of the praiseworthy projects currently in operation, such as the work at I. C. I., Felt and Textiles or the Selective Dissemination system at Monash University. Although such projects may compensate in quality for the smaller quantity of local experience compared with U. S. A., for example, Australia needs, and will continue to need, many more experienced people to support currently justifiable applications of computers to library work.

SUBSCRIPTIONS AND EXCHANGE PUBLICATIONS

As an illustration of an "obviously clerical" activity, the annual processing at 50 or so C. S. I. R. O. libraries of some 8000 subscriptions to about 2700 periodicals produced by 35 countries has involved considerable duplication of clerical effort. In preparing fresh schedules for each ordering agency, each library checks latest prices and converts to Australian currency for budgetary purposes, adjusts volume numbers, records changes in title, frequency of publication, new subscriptions and cancellations. A substantial but smaller number of periodicals from overseas research bodies is exchanged for publications by C. S. I. R. O. This exchange material is not costed in the same way as subscriptions, but involves similar adjustment of files to record changes in title, frequency of publication, etc.

After a study of feasibility by the Organization's Committee for Investigating Mechanization In Libraries, the subscription information was co-ordinated and encoded into machine-readable form using a paper-tape perforating typewriter. The punched paper-tape records were processed on the CDC 3200 computer which became operational at Adelaide early this year. A magnetic tape file was formed and used to produce listings to assist in acquisition of additional data concerning prices, receiving library, etc. Information from the card file which registers exchange agreements has been punched on paper tape and is ready for processing by the computer.

The short-term objective is to merge subscription and exchange files to produce joint listings for each country of origin and receiving library. The long-term objectives range from computer-production of re-order letters to collation of titles with those in the World List in order to indicate gaps in the Organization's coverage of periodicals.

This mechanization exercise has not been free from the problems which inevitably arise when a loosely structured file is isolated from the intuition and common sense which previously compensated for defects. Many problems arose from the requirement for separation of composite subscriptions, e. g., parts of Chemical Abstracts received by different libraries. This has been implemented by use of "concealed codes," which do not appear on normal listings, but serve to define the file structure for the computer. Other "concealed codes" preserve information about the location of upper case letters and "tab" operations for subsequent use in preparing typewritten output. "Concealed codes" side step the perennial problem [1] of computers coping with the complex A. L. A. filing rules; a string of characters attached to each entry is used as a file key, e. g. CALO 5000 for "Il Calore" will file correctly and allow for addition of adjacent entries by use of different numeric codes.

COMPUTER APPLICATIONS TO LIBRARY OPERATIONS OVERSEAS

Computer systems for processing serial publications, such as that developed for the Chicago campus of Illinois University, have been described in the literature. A good example is provided by the U. C. S. D. system [10] adapted to the CDC 3600 computer. Control is achieved by associating a computer-produced punched card with each issue of a regular periodical as it is received. Such cards are input to the computer to produce "current-receipt" lists and to update the master file on a monthly basis, at the same time producing control cards for the next month and a "non-receipt" list of overdue items. This elaborate system also provides for notification of renewal dates and for noting completion of a series of issues to a stage ready for binding.

Circulation control by computer has been implemented at Southern Illinois University at an equipment cost of $40, 000. Considerable clerical effort can be avoided in a large organization by computer production of routing schedules for periodicals so that such lists rapidly adjust to departures of staff, to the addition of new employees' requirements and to notified changes in requirements to see periodicals. Such applications may not be efficient unless the data and equipment are available for other administrative purposes. In similar way the computer production of a printed book catalogue at Florida Atlantic University would not be economically justifiable were it not for the additional objective of performing bibliographic searches using the basic data exploited for the catalogue.

The combined requirement for printed output and bibliographic searching may be exemplified by the MEDLARS project of the National Library of Medicine where computer output controls special photocompositing equipment in production of high quality offset printing master plates. Complex searches are conducted by sequential scanning of magnetic tape records by a fast Honeywell computer, but within four years the file is expected to occupy 35 reels of magnetic tape and sequential search even at computer speeds would take three hours.

In this brief review of computerized library operations, numerous applications in other countries and to other library activities have been omitted, since the feasibility of computer applications to many clerical aspects of library work needs little elaboration. It should be remarked, however, that computer processing is not the only, nor necessarily the most economical way, of automating clerical tasks, as will be brought out in other contributions to this conference.

RETRIEVAL BY PUNCHED CARDS

A retrieval system involving an electromechanical sorter for serial search of punched cards was developed at the C. S. I. R. O. Soil Mechanics Section, and will serve to illustrate the dependence of performance on both the mechanics of the retrieval system and the structure of indexing vocabularies. A special attachment to this sorter for detecting coincidence of holes in up to eight columns was used to reduce the number of sorting passes. It is doubtful, however, whether search times of 2 hours for the anticipated collection of 40,000 document references will be acceptable.

The card coding provided for recording "the" U.D.C. number and up to ten 4-digit codes from the Geotechnic Classification, together with the first 5 letters of all authors' names, year of publication, journal and page number, together with "keywords" selected from the Section's approved vocabulary of 130 terms. This mixture of indexing and cataloguing elements is an interesting reflection of the retrieval approaches most familiar to research scientists. They recall work areas of certain authors, are familiar with the coverage of certain journals and are at ease with decimal classification of the universe. Provision of indexing terms for U. D. C., the Geotechnic Classification and Keywords is a considerable burden, but otherwise a searcher using one index would miss relevant references indexed only under another system.

An inherent difficulty with serial search systems is that if they succeed and grow, search times increase until they are eventually unacceptable. It is possible, when this stage is reached, to use a computer to restructure an information file into a form suited to other equipment and other search procedures. In the Soil Mechanics system this will not be possible without considerable effort, since the titles and other citation details are not in machine-readable form; they are typed on the punched card.

RETRIEVAL FROM MAGNETIC TAPE

Already in machine-readable form, some 5,000 indexed records of technical reports have been accumulated on magnetic tape for the W. R. E. Library system over a period of two years. Computer searches by an IBM 7090 average 3-3 1/2 minutes including printout and can accommodate up to 22 search terms simultaneously. The system includes Selective Dissemination of Information output, together with Accession Listing while new records are added to the magnetic tape file at a rate of 50 per minute of computer time.

Within the remaining "life-time" of the equipment, it is unlikely that serial search through the growing file will consume as much as 15 minutes. It would, however, be possible to use the computer to invert the file into records of documents associated with each index term and use time-sharing techniques to select relevant records for detailed searching, thus effecting a substantial reduction in the cost of searches. The cost of file maintenance would be increased and it is clear that the W. R. E. system has not grown to the size where an inverted file would be warranted.

The indexing lead-in vocabulary of 3400 alphabetically arranged terms was derived from an alphabetic lead-in vocabulary to U. D. C. schedules and has been found to correspond quite closely with the Joint Engineering Council's Thesaurus. Favourable consumer response to search results has been attributed to the high specificity of indexing terms, which is possible with a vocabulary comparable in size with the document collection, and which permits the maximum number of index terms per document to be as low as 4.

Decisions concerning size of vocabulary, depth of indexing, structural relationships of index-terms, etc., which may affect "retrieval efficiency" are of vital importance since the main reason for indexing documents is to be able to find them again in response to a relevant request.

ASLIB CRANFIELD INDEXING EXPERIMENT

One of the most effective investigations of efficiency of indexing systems was the ASLIB Cranfield research project, which began in 1957 and led to a comprehensive report by C. W. Cleverdon (1962). For this well designed experiment, 18,000 documents were indexed according to a Faceted Scheme (with preferred order and chain index), an Alphabetical Subject Catalogue, a Co-ordinate Uniterm Index and the Universal Decimal Classification. Five different time intervals were allowed for each of three indexers to process documents grouped in three batches of 6,000 documents. Three rounds of search requests totalling 1,200 questions were derived from documents in the collection and used in search programmes carried out by members of the Project Staff and by technical personnel (postgraduate students) using each index.

The percentage of searches which successfully retrieved the document on which the source question was based, Cleverdon [3, p. 82] reported "if allowance is made for the possible standard error ... would produce the following figures:-

U. D. C.	73.1% - 78.1%
ALPHABETICAL	79% - 84%
FACET	71.3% - 76.3%
UNITERM	79.5% - 84.5%

Taking these at their highest and lowest ranges shows that all four systems could be within the range of 3.2%, and it is doubtful if a claim that this is significant in an investigation of this nature could be substantiated." To the question--"What system is recommended?", Cleverdon responded that "this is impossible to answer without qualification, for no system which has been investigated has shown itself to be so markedly superior as to justify its use in all conditions... However, our own predilection (a word which we use in its precise meaning, for we can produce little data to substantiate it) would be..." computer printed indexes for a special facet classification designed for the purposes of the user, with an average of eight combinations of index elements per document.

Farradane (1961) phrased the "no difference" conclusion as: "Cleverdon, in his comparison of retrieval by four systems, obtained the same accuracy of retrieval of a given document (75 per cent) by alphabetical indexing as by the others..." A review in The Times Literary Supplement (1963) claimed that "with a total of approximately 1,150 searches carried out on the U. D. C., Alphabetical and Uniterm indexes and 1,050 carried out in Facet Analysis, no significant difference was found in the percentage of success for any of these four systems. The same was found to be true of every type of test made during this study... It must be emphasized that despite the vast literature of claims and counter-allegations in this field, Mr. Cleverdon and his group found no evidence that would indicate that any of the systems... was superior to the others."

Echoing the review by Phyllis Richmond (1963) of the Cranfield Project, Irving Klempner (July, 1964) commented that "statistical compilations resulting from the Cleverdon study... derived from the variant systems under investigation are statistically quite close, ... based on the Cleverdon work to date, no definite conclusions can be made as yet with regard to the comparative efficiency of the four indexing systems..." More cautiously, Barbara Kyle (June, 1964) submitted "with some confidence that 'Within the field of knowledge tested, other things being equal, about the same operating efficiency can be achieved by the use of any of the... systems.'"

However phrased by Farradane, The Times, Richmond, Klempner or Kyle, the "null hypothesis", that no significant difference in retrieval rates was found, must be rejected. The existence of significant differences was definitely established by J. T. Harris in a flawless [6] statistical analysis appended to the Cleverdon report: "The contributions of Method [of indexing] and Staff [Project contrasted with Technical staff] are significant by way of interaction. The results for Technical [searchers] are more varied than those for Project [Staff searchers]. For both, Uniterm is the most and Facet the least favourable... Next to Uniterm for Project comes Alphabetical. The difference is small... The second place for Technical is held by U. D. C. and this is fairly close to Uniterm."

INTERPRETATION OF RESULTS

Four considerations, which might "explain away" the differences in performance, must be examined. Firstly, the statistical significance of differences need not mean that they have practical significances; they may not be substantial. Retrieval performances shown in Table I as percentage failure to retrieve confirm the observation by Harris that Uniterm is the most and Facet the least favourable result for both technical and Project staff searches. Odds of over a hundred to one could be offered that Facet searches would fail more often than Uniterm, and a failure rate half as big again as Uniterm's may legitimately be regarded as a substantial difference. Although a similar difference in performance of Technical searches favours Uniterm against Alphabetical indexing, the less substantial difference for Project searches of U. D. C. and Uniterm raises difficulties in interpretation, as outlined subsequently.

Secondly, the range comparison used for Cleverdon as a measure of statistical/

practical significance must be examined. The 95% confidence bounds shown in Table I indicate the range within which the failure rate can be asserted with 95% confidence to lie. Such ranges correspond roughly with values erroneously called "standard error" in the Cleverdon report. Values obtained from a correctly quoted formula for standard error had been doubled on the grounds that "one conventionally allows for 20 when the probability that the figures are accurate is something over 94% (Cleverdon, personal communication, 1963). Odds around a thousand to one could be offered against occurrence by chance of the 3.2% gap between 95% confidence ranges, so that Cleverdon's doubt "if a claim that this is significant" must relate to non-statistical considerations.

Thirdly, a non-statistical consideration is the possibility that Facet was handicapped by physical constraints of preferred order and chain index. In supplementary tests of Facet the chain index was discarded and an average of 4-5 permutations of original indexing notations were used in a repetition of 400 previous search programmes. The previous failure percentage was reduced by 8% to about 18%; "higher [success] than either U. D. C., Alphabetical or Uniterm in the main test." The validity of this comparison can be considered in the context of various sources of retrieval failure.

A detailed analysis of reasons for retrieval failures was presented by Cleverdon for searches in the first two rounds involving documents indexed in the third batch. Assuming that these searches are representative, percentage failure attributable to different sources can be derived as in Table I for each indexing system and class of searcher. These figures indicate a slight superiority of Project staff searchers for all categories of error and attribute over half retrieval failures to indexing errors. Marked deviation from the overall pattern suggests that Technical personnel are substantially less effective in searching Alphabetical and Facet indexes. It is difficult to interpret the slightly larger proportion of indexing errors encountered by Project searchers in the U. D. C. index, as was noted previously. More errors may have been encountered in searches not attempted by Technical staff or they may have compensated more effectively for indexing errors or too much may be being made of small differences between derived figures.

The 8% reduction in Facet failures cannot be ascribed to indexing errors or inapt questions, since these were not affected by permuting original notations, but corresponds closely with the total for failures due to searching, system, etc. Similar deductions for the other indexing systems leads to the interesting comparison: Facet 18% (18%), Alphabetical 13.3%(13.8%), Uniterm 15.3% (14.8%) and U. D. C. 19.3%(15.2%) for searches by Project (Technical) Staff.

Fourthly, a crucial non-statistical consideration is the effect of "depth of indexing." Cleverdon demonstrated in tests of the Facet catalogue constructed for testing the W. R. U. system, that by increasing the "depth of indexing" a higher proportion of relevant documents could be retrieved with a corresponding increase in the proportion of irrelevant material in the documents retrieved It would be possible, therefore, that the observed differences between systems were merely due to indexing to a different depth in each system, and do not reflect genuine essential differences in potential performance.

"Within the range in which we were operating, it appears that 1% improvement in relevance results in a 3% drop in recall." Using the recall ratios reported in Table 6.3 of the Cleverdon report, where the U. D. C. recalled twice as much irrelevant material as Uniterm, it is possible to estimate failure rates as though all indexes had operated at the relevance ratio observed for Facet; Facet 26.2%, Alphabetical 19.7%, Uniterm 14.7% and U. D. C. 29.5%. The effect of considering the different "relevance ratios", therefore, increases the apparent superiority of Uniterm, closely followed by Alphabetical, and records a penalty against U. D. C.'s less specific indexing for producing more irrelevant retrievals. Superiority of Uniterm is also suggested by the improvement of indexing proficiency with experience, which is manifested by the figures at the bottom of Table I. Moreover, supplementary indexing at 49 organizations in the United States, United Kingdom, Canada and Holland for the Cranfield Research Project resulted in failure rates for supplementary searchers of: Facet 20.8%, Alphabetical 23.7%, Uniterm 12.2% and U. D. C., 23.9%, which, in the words of Cleverdon "also emphasises again the higher efficiency of Uniterm at the shortest indexing time".

TABLE I

TABLE I. ASLIB Cranfield Retrieval Failures

Searches by Project Staff and Technical Staff for the four indexing systems.

	FACET		ALPHA		UNITERM		U. D. C.	
	Proj.	Tech.	Proj.	Tech.	Proj.	Tech.	Proj.	Tech.
No. of Searches	1047	502	1154	684	1146	366	1157	652
Failures	274	167	213	183	206	69	282	132
% Failure	26.2%	33.3%	18.5%	26.8%	18.0%	18.9%	24.4%	20.2%
95% Confidence Bounds on % Failure to Retrieve								
Upper	28.9%	37.3%	20.8%	30.2%	20.2%	23.8%	26.9%	23.4%
Lower	23.4%	29.3%	16.2%	23.4%	15.7%	14.0%	21.9%	17.1%
Errors prorated from Tables 5.4-5.7 of the Cleverdon report (1962).								
%Failure due to								
Searching	4.2%	11.0%	3.7%	8.6%	2.2%	3.4%	2.7%	3.4%
Indexing time	3.4%	4.7%	3.5%	4.3%	4.7%	3.8%	5.6%	3.1%
Indexing personal	8.4%	8.0%	6.7%	7.5%	6.1%	6.3%	10.5%	8.1%
Poor question	4.2%	5.3%	3.1%	4.0%	4.5%	4.7%	3.2%	4.0%
System, etc.	4.0%	4.3%	1.5%	2.4%	0.5%	0.7%	2.4%	1.6%
Total:	26.2%	33.3%	18.5%	26.8%	18.0%	18.9%	24.4%	20.2%
Documents indexed in	[Significant at 0.5% level; odds of 200:1]							
First Third	-	-	25.3%	-	30.1%	-	36.1%	-
Second Third	25.5%	-	19.7%	-	23.4%	-	25.8%	-
Last Third	26.3%	-	17.5%	-	15.6%	-	22.8%	-
Improvement rating	?		1.4		2.0		1.6	

COMPUTER AIDS TO INDEX DESIGN

Research scientists frequently become aware of relevant literature by following up references to previous publications. The utility of this procedure for extending awareness backwards in time has prompted the use of computer processing to supply corresponding links forwards in time by listing suubsequent citations of previous publications. Of well tried value in the field of Law, such citation indexes have recently been produced by computer processing for wide-ranging fields of Science and Technology.

The procedure involved is simple but involves considerable clerical effort to record on punched card each reference listed by the author of each article published in a selected group of periodicals during a selected period. By suitable rules for condensation, both the citing reference and cited reference can be recorded on one card. These records are sorted to group citing references for each cited reference and to sequence them according to date of publication, name of author and name of journal. The file may then be listed by a computer in a suitable layout for subsequent photo-offset printing.

Garfield's (1962) Genetics Citation Index, a selection from the Science Citation Index, has been scrutinized in particular case of the publications of Sir Ronald Aylmer Fisher, whose complete works have been collected in C. S. I. R. O. Clerical errors and inconsistent "cataloguing" conventions for cited works, noted by Martyn (1965), certainly mar but do not destroy the utility of this index to "frontier" research workers and research planners anxious to avoid duplication of research and to detect research gaps.

In the process of adding recent citation data to the file it is possible to provide an "Alert" service by printing recent citations of any of a nominated group of articles. Such a computer produced service is available commercially in the U. S. A., and is provided at M. I. T. for citations of articles whose author is on the campus. "Bibliographic coupling" of publications which cite a number of references in common is being evaluated as an indicator of the existence of well-established notions or of newly emerging notions, which may warrant the inclusion in indexes of an appropriate new indexing term.

With mixed success, computers have been applied to the statistical processing of text data with the aim of developing empirical classifications and associated procedures for automatic classification of similar text. Considerably more effective has been D. D. C.'s use of a computer to minimise cross-reference between groups of terms and thus improve the efficiency of computer processing of search requests.

A Key-Word-In-Context listing of papers for this Conference (see Appendix) illustrates the centring of key-words in the line and the display of adjacent context which is typical of computer-produced permuted title listings. Costing between three pence and two shillings a title, depending on the equipment used, KWIC listings have come to be regarded as quick, cheap and surprisingly effective approximations to an index; e. g. Chemical Titles, Biological Titles, Index to Computing Reviews, etc.

A frequent objection to KWIC lists as indexes can be overcome by inserting additional indexing terms into titles needing them and by putting unwanted title terms on the KWIC system's "stop-list" of words such as "the", "is", "if", "and", etc., which the system avoids treating as key-words. With little effort a KWIC system could be adjusted to match key title terms against a magnetic tape file recording inter-term relationships such as those of the J. E. C. Thesaurus. Preferred terms could be inserted and see also pseudo-titles added whenever both the seen and see from terms occur in the listing. Editing to treat metaphoric or analogous use of title terms appears to be impracticable without human intervention. This appropriate guidance could well involve minimal clerical effort on the part of the human in arriving at an index difficult to distinguish from a competent conventional Alphabetical index.

"Adaptive" development of an index by guiding a computer in its processing of a selection of titles is of far greater relevance for a research scientist's personal retrieval system than for normal library purposes. In this context it appears feasible to use the computer processing to indicate the effectiveness of a scientist's use of indexing terms and to produce retrieval aids such as split-page Uniterm listings and visual-aspect punched cards.

CONCLUSION

In surveying applications of computers to library work, attention has been drawn to the clerical content of library operations and classification work. An initial increase in clerical effort is required to achieve the accuracy and consistency of input data required to enable automatic processing to carry the burden of subsequent operations at an acceptable level of quality. Cost comparisons of computer applications with alternative implementations are more realistic if based on evaluation of a pilot trial.

Effective automatic retrieval depends not only on suitable systems design of an implementation, but even more on the efficiency of the indexing system. Although misinterpretations of the results of Cleverdon's significant comparison of the efficiency of indexing system have been challenged, it should be emphasized that the Cranfield Research Project represents a major contribution to empirical evaluation of techniques relevant to library work. It has been submitted that the results favour indexing which permits co-ordination of indexing elements during searches. There is reason to believe that a cross-referencing structure in the lead-in vocabulary plays an important role in reducing retrieval failures.

In a brief survey of computer-produced indexes, attention has been drawn to the need for human interaction with the computer system to enforce consistency and improve the quality of the product. Computer aids to indexing have been considered a potentially fruitful means for extending the resources of modern librarianship to more specialized user-oriented retrieval systems.

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Mr. Hill's paper was read at the Thirteenth Biennial Conference of the Library Association of Australia and the author acceded to our request that we should have the privilege of printing it in the current issue of the Annals of Library Science and Documentation. We are most grateful to him for this gracious gesture of goodwill towards us.

REPORTING OF INDIAN MATHEMATICS LITERATURE IN THE MATHEMATICAL REVIEWS AND THE BULLETIN SIGNALÉTIQUE

T S RAJAGOPALAN
B K SEN
K L GOGIA
J C GERA

Insdoc, Delhi-12

Studies the extent of coverage and speed of reporting of Indian mathematics literature in the Mathematical Reviews and the Bulletin Signalétique using the Bibliography of Scientific Publications of South and South East Asia as the basis. Coverage of journals as a whole and problems relating to seepage and scatter of Indian mathematics literature are the other aspects dealt with.

1 INTRODUCTION

India has a creditable record of research in the field of Mathematics. The study of Mathematics which was pursued intensively till the end of the twelfth century received a set-back subsequently and this situation almost prevailed over a long period of about eight hundred years. The twentieth century, however brought about the reniassance of mathematical research in our country. In 1907 the Indian Mathematical Society, in 1908 the Calcutta Mathematical Society and in 1919 the Banaras Mathematical Society were founded. These societies started publication of three periodicals i.e. Journal of the Indian Mathematical Society (1909), Bulletin of the Calcutta Mathematical Society (1909) and Proceedings of Banaras Mathematical Society (1919). The Journal of the Indian Mathematical Society is now published in two parts i.e. the Journal of the Indian Mathematical Society and the Mathematics Student. The title of the periodical the " Proceedings of the Banaras Mathematical Society" has been changed to "Ganita" and the name of the Society has also been changed to Bharat Ganita Parishad. The subject of Mathematics now receives great attention in almost all the Universities. In addition the following institutions and societies are engaged in the study of Mathematics [1, 7-9].

1. All India Astrological and Astronomical Society, Calcutta.
2. Allahabad Mathematical Society.
3. Allahabad University Mathematical Association.
4. Bharat Ganita Parishad, Lucknow.
5. Bombay Mathematical Colloquium.
6. Calcutta Mathematical Society.
7. Calcutta Statistical Association.
8. Indian Institute of Technology, Kharagpur.
9. Indian Inter-planetary Society, Calcutta.
10. Indian Mathematical Society, Delhi.
11. Indian Society of Agricultural Statistics, New Delhi.
12. Indian Society of Theoretical and Applied Mechanics, Kharagpur.
13. Indian Statistical Institute, Calcutta.
14. Institute of Mathematical Science, Madras.
15. Ramanujam Institute of Mathematics, Madras.
16. Tata Institute of Fundamental Research, Bombay.

The following Observatories are conducting research in Astronomy:

1. Astrophysical Observatory, Kodaikanal.
2. Ionospheric Research Station, Haringhata.
3. Kodaikanal Observatory.
4. U P State Observatory.

There are at present 12 periodicals exclusively devoted to Mathematics. They are:

1. Bulletin of the Allahabad University Mathematical Association (1942).
2. Bulletin of the Calcutta Mathematical Society (1909).
3. Bulletin of the Central Research Institute, University of Kerala Series B Statistics (1950).
4. Calcutta Statistical Association Bulletin(1951).

5 Ganita (1950).
6 Indian Journal of Mathematics (1958).
7 Journal of the Indian Mathematical Society (1947).
8 Journal of the Indian Society of Agricultural Statistics (1949).
9 Mathematics Seminar (1960).
10 Mathematics Student (1932).
11 Matscience Report
12 Sankhya, Series A & B (1933).

In addition the following periodicals carry a good number of articles of mathematics interest:

1 Applied Physics Quarterly (1954).
2 Bulletin of the Central Research Institute. University of Kerala, Series A (1950).
3 Bulletin of the National Geophysical Research Institute, Hyderabad (1963).
4 Current Science (1932).
5 Defence Science Journal (1949).
6 Indian Journal of Physics (1927).
7 Indian Journal of Pure and Applied Physics (1963).
8 Indian Journal of Theoretical Physics (1953).
9 Journal of the Aeronautical Society of India (1949).
10 Journal of the Indian Institute of Science (1918).
11 Journal of the Indian Medical Profession (1954).
12 Journal of the Institute of Armament Studies (1962).
13 Journal of the Karnatak University. Science (1956).
14 Journal of the Madras University. Sec B (1940).
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20 Proceedings of the National Academy of Sciences India Sec A (1931).
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The growth of Indian literature in Mathematics including Mechanics and Astronomy in the last few years may be seen in Tables 1 and 2. Table 1 gives the number of periodical articles on Mathematics as reported in the Bibliography of Scientific Publications of South and South East Asia (hereafter referred to as the Bibliography).

TABLE 1

INDIAN PERIODICAL ARTICLES ON MATHEMATICS

Year of the Bibliography	No. of articles reported in the Bibliography
1955	209
1956	175
1957	182
1958	172
1959	235
1960	202
1961	299
1962	322
1963	333
1964	278

In Table 2 the number of books published in India in the fields of Mathematics, Astronomy and Mechanics as reported by the Indian National Bibliography is given. Not all of them are, however, scholarly publications as school and college textbooks have also been included in this data.

TABLE 2

INDIAN BOOKS ON MATHEMATICS

Year of the Indian National Bibliography	No. of Books
1958	198
1959	153
1960	196
1961	230
1962	198
1963	234

Scope of the Study

The present study on the reporting of Indian mathematics literature in the

Mathematical Reviews and the Bulletin Signalétique Sec I, II and III is yet another in the series of studies being made by us on the reporting of Indian scientific literature in major international abstracting and indexing services. The studies already reported are on the coverage of Indian literature in Physics, Chemistry and Chemical Technology, Biological sciences, and Agriculture. [6, 2, 4, 5]. They have been made in relation to abstracting services published in English, whereas the present study analyses the coverage of Indian mathematics literature in an abstracting service published in French i.e Bulletin Signalétique in addition to Mathematical Reviews, published in English. Exhaustiveness of reporting, speed of reporting, coverage of journals as a whole, seepage and scatter of mathematics literature are the aspects dealt with in this paper.

Source for the Study

The Bibliography has been taken as the base for this study. All the entries of 1961 and 1962 under Mathematics (=B) with the omission of reports and theses have been taken into consideration. It may be pointed out here that main class B of Colon Classification is constituted of Pure and Applied Mathematics, Mechanics, Physico-Mathematics and Astronomy. All the entries of the Bibliography have been checked in the Mathematical Reviews as well as in the respective sections of the Bulletin Signalétique. For checking in the Bulletin Signalétique the entries have been further divided subject-wise, because entries under Arithmetic to Geometry (=B1 to B6), Mechanics and Physico-mathematics (=B7 and B8) and Astronomy (=B9) in the Bibliography relate to Bulletin Signalétique Sec I Pure and Applied Mathematics, Sec III Physics I (Mechanics, Physico-Mathematics etc) and Sec II Astronomy and Astrophysics respectively. It has, however, been noticed that some entries under B1 to B6 and B9 have been noticed in Sec III and Sec II Pt 2 respectively. Similar is the case with entries of B7. In order to be sure as to not to miss any possible entry, all the untraced entries relating to a particular section have been checked in the remaining two sections of the Bulletin Signalétique. Quite a few entries have been located in this manner. Even then a few entries out of the periodicals actually covered in the Bulletin Signalétique could not be traced. There is a possibility of their being reported in sections other than Sec I, II and III.

For the 1961 and 1962 entries of the Bibliography, the Mathematical Reviews has been checked upto 1963 and 1964 respectively. As it has been noticed that articles are covered rapidly in the Bulletin Signalétique, the checking has been confined here upto June issue of 1963 and 1964 respectively for 1961 and 1962 entries of the Bibliography. In some cases where it has been found that the articles of a particular periodical have been partly covered, the search has been extended up to June 1965 issue of the respective abstracting services (latest available issue at the time of this study). It may be worth mentioning here that two entries reported in the Bibliography of 1961 have been located as late as in June 1965 issue of the Mathematical Reviews.

2 EXTENT OF REPORTING

In Table 3 (Page 143), journal-wise distribution of articles reported in the Bibliography of the years 1961 and 1962 and their coverage in the two abstracting services are given.

It may be seen that the Mathematical Reviews has reported 55.2 per cent and 50.6 per cent and the Bulletin Signalétique 40.5 per eent and 36.0 per cent of the Indian mathematics literature of the years 1961 and 1962 respectively. The coverages of Indian literature in both the abstracting services offer scope for improvement.

3 QUICKNESS IN REPORTING

The quickness in reporting Indian mathematics literature in the two abstracting services has also been studied and the data given in Table 4(Page 144). The time-lag is determined by calculating the time elapsed between the indexing of the article in the

Bibliography and the appearance of its abstract in the respective abstracting services. However, comparison of speed of reporting of literature between an indexing periodical such as the Bibliography and an abstracting periodical such as the Mathematical Reviews is not equitable. But, the Bibliography has been taken as the base in this study because it has been the only secondary publication covering Indian scientific literature exhaustively and expeditiously upto December 1964. All the important Indian scientific contributions get reported in the Bibliography. It may be reasonably expected that all the articles reported in the Bibliography are worth coverage by international abstracting services. Normally the Bibliography has been indexing the Indian scientific literature within 1-2 months after publication.

It may be seen that the maximum time-lag in reporting in the Mathematical Reviews and the Bulletin Signalétique is 48 and 15 months respectively. The Bulletin Signaletique is published in French and the Indian articles which appear in English have to be translated first into French before abstracting. It may be, therefore, expected that the Bulletin Signalétique would take more time in reporting the Indian literature than the Mathematical Reviews, which is published in English. But the data given in Table 4 present a different trend. Articles are abstracted more rapidly in the Bulletin Signaletique than in the Mathematical Reviews. This may be due to the following reasons:

1 That the abstracts in the Bulletin Signalétique are indicative only; whereas the abstracts in the Mathematical Reviews are quite detailed.

2 That the Bulletin Signalétique usually abstracts all the articles of a particular issue of a journal at a time, whereas the Mathematical Reviews sometime notices the articles in different issues. This point is illustrated further from the data presented in Tables 5 and 6(Page 145).

The coverage of articles appearing in the Indian Journal of Mathematics Vol 3 No 1 in the two abstracting services is given as an example.

It is obvious from the data given in Tables 5-6 that the Mathematical Reviews follow the subject-wise abstracting procedure, where the journals for abstracting move from one abstractor to another on the basis of subject specialisation. Further they seem to rely mostly on panel system for abstracting. The abstracting work might have been entrusted to panel abstractors more according to subject specialities than by journals. This procedure is likely to bring about certain irregularity in coverage if a particular issue of a journal as such is taken into consideration.

4 DISTRIBUTION AND CONCENTRATION

The distribution and concentration of Indian mathematics literature in three major fields i.e Pure and Applied Mathematics, Mechanics and Physico-Mathematics and Astronomy have also been studied in these two services and the data given in Tables 7, 9 and 11(Pages 146-148).

Tables 8, 10 and 12 (Pages 145, 147, 148) present data on the time-lag in reporting the literature of the above three subject groups in the two services.

5 DEPTH OF COVERAGE OF JOURNALS

From Table 3, where the data on the coverage of both the abstracting services are analysed, it may be seen that the percentage of coverage of the Mathmatical Reviews is slightly higher than that of the Bulletin Signaletique. This may be due to the fact that the Mathematical Reviews has covered more periodicals than the Bulletin Signaletique. If the coverage is considered from the point of view of articles appearing in a particular issue of a periodical, the coverage of the Bulletin Signaletique is found to be better than that of the Mathematical Reviews. This will be evident from the data given in Table 13(Page 148).

The difference in performance of the two abstracting services with regard to coverage of articles appearing in particular issues of periodicals may be due to the fact that the Mathematical Reviews has been adopting a stricter criterion than the Bulletin Signalétique in the selection of articles for inclusion. During 1962 the Bibliography has noticed as many as 24 articles from the Journal of the Indian Mathematical Society, of which 15 articles relate to Vol 24 and the remaining 9 to Vol 25. The Bulletin Signalétique, however, appears to have covered this journal from Vol 25 onwards only and this explains the comparatively lower percentage of coverage in 1962 than in 1961.

It may be also seen that the Mathematical Reviews has omitted three periodicals in 1962 whereas the Bulletin Signalétique has added two more periodicals. The smaller number of periodicals covered in 1962 does not reflect any significant trend because a few journals of broader class i.e General Science and Physical Sciences published a few articles on Mathematics in 1961 whereas they did not publish any in 1962. The journal-wise coverage does not therefore substantially change between these two years in this respect.

The data on volume-wise analysis of the articles given in Table 14 (Page 149) as well as the journal index of the Mathematical Reviews have shown that the Mathematical Reviews has covered no articles of the Agra University Journal of Research (Science), from Vol 10- and of the Applied Physics Quarterly from Vol 7-. On the other hand articles of the Mathematics Seminar, Delhi from Vol 2- No. 2- and of the Vijnan Parishad Anusandhan Patrika from Vol 5- are found to have been covered.

The journal index of the Mathematical Reviews clearly indicates that the Indian Journal of Physics, the Indian Journal of Theoretical Physics, the Journal of the Indian Institute of Science, the Journal of the Indian Society of Agricultural Statistics, and the Journal of Scientific Research, Banaras Hindu University have been regularly covered during the years 1961 to 1964. However, no articles of Vol 34 and 35 of the Indian Journal of Physics; of Vol 9 of the Indian Journal of Theoretical Physics; of Vol 42 and 44 of the Journal of the Indian Institute of Science; of Vol 13 of the Journal of the Indian Society of Agricultural Statistics and of Vol 11 of the Journal of Scientific Research, Banaras Hindu University seem to have been covered.

As regards journal coverage by the Bulletin Signalétique the volume-wise analysis of articles covered could alone be attempted in the absence of any list of periodicals covered by the Bulletin Signalétique. The Bulletin Signalétique has started covering the Journal of Indian Mathematical Society from Vol 25 (1962).

6 PROBLEMS OF SEEPAGE AND SCATTER

The periodicals Antiseptic, Coconut Bulletin, Indian Forest Record - New Series (Statistical), Indian Journal of Medical Science, Journal of the Indian Medical Profession have not been covered by any of the two abstracting services, because of the fact that they belong to seepage regions i.e to subjects which are totally alien to the scope of the two services.

The periodicals Current Engineering Practice, Current Science, Defence Science Journal, Electro-technology, Indian & Eastern Engineer, Indian Journal of Meteorology and Geophysics, Journal of the Aeronautical Society of India, Journal of the Institution of Engineers India - General Engineering Division, Journal of the Scientific & Industrial Research Sec A, Journal of the University of Poona - Science & Technology, Journal of the University of Saugar Pt III Sec A, Madhya Bharati, Proceedings of the Rajasthan Academy of Sciences, Science and Culture, Vikram Science and Viswakarma have also not been covered by any of the two abstracting services. All these journals belong to broad or peripheral subjects and they publish only a few articles on Mathematics. It would indeed be difficult for International abstracting services like the Mathematical Reviews and the Bulletin Signalétique to notice and report them.

The data given in Table 15(Page 150) show that the articles from core periodicals account for only about half; from periodicals belonging to broad subjects about one third; and from periodicals belonging to border-line subjects about one-sixth. The remainder accounts for articles appearing in periodicals whose subject is totally alien.

The coverage of mathematics literature in the two services by periodicals as a whole has been further studied with reference to - 1) Core Subjects; 2) Broad subjects; 3) Border-line subjects; ;and 4) Alien subjects. The data have been presented in Table 15.

From Table 16(Page 150) it may be seen that from among the periodicals covered by the Bibliography about 25 per cent are core, about 45 per cent belong to broad subjects, about 24 per cent belong to border-line subjects and the remaining belong to alien subjects.

The coverage of the Mathematical Reviews has come nearly cent per cent in the case of core periodicals. It covers only 50 per cent of periodicals pertaining to broad subjects and still very much less in the case of perodicals belonging to border-line subjects. Its coverage of periodicals belonging to alien subjects is almost nil.

The Bulletin Signalétique has covered about half of the core periodicals and about one-third of the periodicals belonging to the broad subjects. Its coverage is 9 per cent and 22 per cent for the years 1961 and 1962 respectively in respect of periodicals belonging to the border subjects. In the case of periodicals of alien subjects, its coverage is nil.

It is evident from above that it is rather difficult for an international abstracting service devoted to a particular subject discipline to ensure exhaustive coverage of literature for the reason that articles appear in periodicals belonging to broad, border-line and alien subjects and they are liable to escape notice. A national abstracting service, can however ensure good coverage and can act as a feeder service to the international abstracting services. The problems of scatter and seepage of literature would also be solved.

As for the Indian scientific literature, the Indian Science Abstracts, a national abstracting service being published by the INSDOC since January 1965 fulfils this need.

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TABLE 3

EXTENT OF REPORTING

S. No.	Title of Indian Periodical	No. of entries in the Bibliography		No. of articles covered in the Mathematical Reviews		Extent of Reporting		No. of articles covered in the Bulletin Signalétique.		Extent of Reporting	
		1961	1962	1961/63	1962/64	1961	1962	1961/63	1962/64	1961	1962
1	Agra Univ J Res Sci	4	1	1	x	E	x	3	1	B	A
2	Antiseptic	1	-	x	-	x	-	x	-	x	-
3	Appl Phys Quart	10	15	4	-	D	x	x	x	x	x
4	Bull Calcutta math Soc	11	10	5	7	C	C	11	10	A	A
5	Calcutta math Soc golden Jubilee Vol	20	-	20	-	A	-	19	-	B	-
6	Calcutta Stat Ass Bull	4	8	3	4	B	C	x	x	x	x
7	Cocon Bull	-	1	-	x	-	x	-	x	-	x
8	Curr Engng Pract	1	-	x	-	x	-	x	-	x	-
9	Curr Sci	2	1	x	x	x	x	x	x	x	x
10	Defence Sci J	10	14	x	x	x	x	x	x	x	x
11	Electro-technology	1	-	x	-	x	-	x	-	x	-
12	Ganita	-	11	-	10	-	B	-	11	-	A
13	Indian east Engr	1	1	x	x	x	x	x	x	x	x
14	Indian For Res N S Stat	1	-	x	-	x	-	x	-	x	-
15	Indian J Math	5	20	5	17	A	B	5	20	A	A
16	Indian J Met Geophys	1	-	x	-	x	-	x	-	x	-
17	Indian J med Sci	1	-	x	-	x	-	x	-	x	-
18	Indian J Phys	8	4	1	2	E	C	7	1	B	E
19	Indian J theor Phys	5	6	4	x	B	x	x	x	x	x
20	J M S Univ Baroda	2	5	2	4	A	B	x	x	x	x
21	J aero Soc India	1	8	x	x	x	x	x	x	x	x
22	J Indian Inst Sci	4	5	2	x	C	x	3	2	B	D
23	J Indian math Soc	25	24	20	23	B	B	x	9	x	D
24	J Indian med Prof	17	8	x	x	x	x	x	x	x	x
25	J Indian Soc agric Stat	9	7	7	x	B	x	x	x	x	x
26	J Instn Engrs India-gen Engng Div	-	1	-	x	-	x	-	x	-	x
27	J Madras Univ	5	3	3	2	C	C	5	x	A	x
28	J Sci Engng Res	14	5	11	2	B	D	x	x	x	x
29	J sci industr Res, Sec A	1	1	x	x	x	x	x	x	x	x
30	J sci industr Res, Sec B	1	4	x	x	x	x	x	3	x	B
31	J sci industr Res, Sec D	1	4	x	x	x	x	x	3	x	B
32	J sci Res Banaras Hindu Univ	2	2	x	1	x	C	2	2	A	A
33	J Technol	1	-	1	-	A	-	x	-	x	-
34	J Univ Poona Sci Tech	2	1	x	x	x	x	x	x	x	x
35	J Univ Saugar Sec A	3	-	x	-	x	-	x	-	x	-
36	Madhya Bharati	5	-	x	-	x	-	x	-	x	-
37	Math Seminar Delhi	2	4	x	4	x	A	x	x	x	x
38	Math Stud	19	46	14	33	C	C	x	x	x	x
39	Proc Indian Acad Sci Sec A	11	4	8	2	B	C	11	4	A	A
40	Proc nat Acad Sci India Sec A	15	8	3	5	E	C	15	8	A	A
41	Proc nat Inst Sci India Pt A	24	39	23	19	B	D	x	x	x	x
42	Proc Rajasthan Acad Sci	2	3	x	x	x	x	x	x	x	x
43	Res Bull Punjab Univ Sci	1	-	1	-	A	-	x	-	x	-
44	Sankhya	21	-	14	-	C	-	20	-	B	-
45	Sankhya Ser A	19	28	13	15	C	C	19	27	A	B
46	Sankhya Ser B	1	15	x	10	x	C	1	15	A	A
47	Sci & Cult	1	1	x	x	x	x	x	x	x	x
48	Vijn Parishad Anusand Patr	3	3	x	3	x	A	x	x	x	x
49	Vikram Sci	1	-	x	-	x	-	x	-	x	-
50	Viswakarma	-	1	-	x	-	x	-	x	-	x
	Total:	299	322	165	163			121	116		
	Percentage	100.0	100.0	55.2	50.6			40.5	36.0		

Explanation of the Symbols:

A = Full coverage
B = 75% to 99%
C = 50% to 74%
D = 25% to 49%
E = Below 25%
x = No coverage
- = Not covered even in B S P.

TABLE 4

TIME-LAG IN REPORTING

Difference in time-lag from the Bibliography. (in months)	MATHEMATICAL REVIEWS 1961	MATHEMATICAL REVIEWS 1962	BULLETIN SIGNALÉTIQUE 1961	BULLETIN SIGNALÉTIQUE 1962
2	1	-	-	-
3	2	1	1	4
4	-	1	3	7
5	2	1	12	9
6	4	1	11	16
7	11	3	6	20
8	18	7	17	14
9	13	27	19	22
10	7	22	23	11
11	4	18	4	13
12	5	13	4	-
13	10	7	-	-
14	5	7	2	-
15	19	4	19	-
16	12	8		
17	9	5		
18	2	8		
19	4	2		
20	3	4		
21	3	8		
22	3	x		
23	-	4		
24	1	3		
25	1	2		
26	2	2		
27	1	2		
28	-	3		
30	2	-		
34	2	-		
35	5	-		
36	3	-		
37	2	-		
38	1	-		
39	2	-		
40	1	-		
42	1	-		
43	1	-		
45	1	-		
48	2	-		
Total	165	163	121	116
Percentage				
1 - 6 months	5.45	5.5	22.3	30.4
7 - 12 months	35.15	35.2	60.3	69.6
13 - 19 months	34.55	34.6	17.4	x
19 months onwards	24.85	24.9	x	x

TABLE 5

COVERAGE OF ARTICLES FROM THE INDIAN JOURNAL OF MATHEMATICS

Pages relating to the articles appearing in Indian J Math Vol 3 No 1	Months in which noticed in the Bibliography	Months in which abstracted in the Mathematical Reviews.	Months in which abstracted in the Bulletin Signalétique
1 - 5	April 1962	April 1963	Nov-Dec 1962
7 -26	"	April 1964	"
27 -37	"	-	"
39 -45	"	March 1963	"
63 -72	"	January 1964	"
73 -76	"	April 1963	"
77 -83	"	-	"
85 -90	"	January 1964	"

TABLE 6

ILLUSTRATION ON THE SUBJECT-WISE ABSTRACTING PROCEDURE IN THE MATHEMATICAL REVIEWS

Title of the Indian Periodical	Bibliographical details of the articles.	Subject of the articles.	Month in which abstracted in the Mathematical Reviews.
J Indian Math Soc (N S)	Vol 26 (1962) pp 115-24	Theory of numbers	Jan 65 (Ser No 77)
	Vol 25 (1961) pp 109-19	"	Jan 65 (Ser No 79)
	Vol 27 (1963) pp 57-65	"	Jan 65 (Ser No 80)

TABLE 8

PURE AND APPLIED MATHEMATICS (=B1 to B6)

TIME-LAG IN REPORTING

Difference in time-lag from the Bibliography (in months)	1961		1962	
	Mathematical Reviews.	Bulletin Signaletique.	Mathematical Reviews.	Bulletin Signaletique.
3	-	-	1	4
4	-	2	1	7
5	-	7	1	4
6	2	4	-	13
7	9	-	2	13
8	9	14	6	9
9	9	19	22	21
10	4	18	18	11
11	1	-	14	12
12	3	2	10	-
13	4	-	5	-
14	5	2	7	-
15	14	19	3	-
16	10	-	8	-
17	8		5	
18	2		7	
19	4		2	
20	2		3	
21	3		8	
22	3		-	
23	-		3	
24	1		2	
25	1		2	
26	2		2	
27	1		2	
28	-		3	
30	2		-	
34	2		-	
35	4		-	
36	3		-	
37	2		-	
39	2		-	
40	1		-	
42	1		-	
43	1		-	
45	1		-	
48	1		-	
Total	117	87	137	94

TABLE 7

PURE AND APPLIED MATHEMATICS (=B1 to B6)

EXTENT OF COVERAGE

S. No.	Title of Indian Periodical	No. of entries in the Bibliography		No. of entries covered in the Mathematical Reviews.		Extent of Reporting		No. of entries covered in the Bulletin Signalétique.		Extent of Reporting.	
		1961	1962	1961/63	1962/64	1961	1962	1961/63	1962/64	1961	1962
1.	Agra Univ J Res Sci	3	1	1	x	D	x	2	1	C	A
2.	Antiseptic	1	-	x	-	x	-	x	-	x	-
3.	Bull Calcutta math Soc	4	5	4	5	A	A	4	5	A	A
4.	Calcutta math Soc golden Jubilee Vol	17	-	17	-	A	-	17	-	A	-
5.	Calcutta Stat Ass Bull	4	8	3	4	B	C	-	x	-	x
6.	Cocon Bull	-	1	-	x	-	x	-	x	-	x
7.	Curr Sci	1	1	x	x	x	x	x	x	x	x
8.	Defence Sci J	-	9	-	x	-	x	-	x	-	x
9.	Ganita	-	10	-	10	-	A	-	10	-	A
10.	Indian For Res N S Stat	1	-	x	-	x	-	x	-	x	-
11.	Indian J Math	5	16	5	15	A	B	5	16	B	A
12.	Indian J med Sci	1	-	x	-	x	-	x	-	x	-
13.	Indian J Phys	1	2	x	2	x	A	x	x	x	x
14.	J M S Univ Baroda	2	5	2	4	A	B	x	x	x	x
15.	J Indian Inst Sci	-	1	-	x	-	x	-	x	-	x
16.	J Indian math Soc	23	20	18	20	B	A	x	9	x	D
17.	J Indian med Prof	17	8	x	x	x	x	x	x	x	x
18.	J Indian Soc agric Stat	9	7	7	x	B	x	x	x	x	x
19.	J Madras Univ	4	3	2	2	C	C	4	x	A	x
20.	J Sci Engng Res	4	-	3	-	B	-	x	x	x	x
21.	J sci industr Res Sec B	1	1	x	x	x	x	x	1	x	A
22.	J sci Res Banaras Hindu Univ	2	2	x	1	x	C	2	2	A	A
23.	J Univ Poona Sci Tech	2	1	x	x	x	x	x	x	x	x
24.	J Univ Saugar Sec A	3	-	x	-	x	-	x	-	x	-
25.	Madhya Bharati	5	-	x	-	x	-	x	-	x	-
26.	Math Seminar Delhi	2	1	x	1	x	A	x	x	x	x
27.	Math Stud	12	42	8	32	C	B	x	x	x	x
28.	Proc Indian Acad Sci Sec A	3	2	2	2	C	A	3	2	A	A
29.	Proc nat Acad Sci India Sec A	10	6	3	5	D	B	10	6	A	A
30.	Proc nat Inst Sci India Pt A	14	9	14	6	A	C	x	x	x	x
31.	Proc Rajasthan Acad Sci	-	2	-	x	-	x	-	x	-	x
32.	Res Bull Punjab Univ Sci	1	-	1	-	A	-	x	-	x	-
33.	Sankhya Ser A	40	28	27	15	C	C	39	27	B	B
34.	Sankhya Ser B	1	15	x	10	x	C	1	15	A	A
35.	Sci & Cult	1	-	x	-	x	-	x	-	x	-
36.	Vijn Parishad Anusad Patr	3	3	x	3	x	A	x	x	x	x
37.	Vikram Sci	1	-	x	-	x	-	x	-	x	-
	Total	198	209	117	137			87	94		
	Percentage	100.0	100.0	59.1	65.5			41.1	45.0		

TABLE 9

MECHANICS AND PHYSICO-MATHEMATICS (=B7 & B8) – EXTENT OF COVERAGE

S. No.	Title of Indian Periodical	No. of entries in the Bibliography		No. of entries covered in the Mathematical Reviews.		Extent of Reporting		No. of entries covered in the Bulletin Signalétique		Extent of Reporting	
		1961	1962	1961/63	1962/64	1961	1962	1961/63	1962/64	1961	1962
1.	Agra Univ J Res Sci	1	-	x	-	x	-	1	-	A	-
2.	Appl Phys Quart	10	15	4	x	D	x	x	x	x	x
3.	Bull Calcutta math Soc	7	5	1	2	E	D	7	5	A	A
4.	Calcutta math Soc golden Jubilee Vol	3	-	3	-	A	-	2	-	C	-
5.	Curr Engng Pract	1	-	x	-	x	-	x	-	x	-
6.	Defence Sci J	10	5	x	x	x	x	x	x	x	x
7.	Electro-technology	1	-	x	-	x	-	x	-	x	-
8.	Ganita	-	1	-	x	-	x	-	1	x	A
9.	Indian east Engr	1	-	x	-	x	-	x	-	x	-
10.	Indian J Phys	2	1	1	x	C	x	2	1	A	A
11.	Indian J theor Phys	4	6	3	x	B	x	x	x	x	x
12.	J aero Soc India	1	8	x	x	x	x	x	x	x	x
13.	J Indian Inst Sci	3	3	2	x	C	x	2	1	C	D
14.	J Indian math Soc	2	4	2	3	A	B	x	x	x	x
15.	J Madras Univ	1	-	1	-	A	-	1	-	A	-
16.	J Sci Engng Res	10	5	8	2	B	D	x	x	x	x
17.	J sci industr Res Sec B	-	2	-	x	-	x	-	1	-	C
18.	J sci industr Res Sec D	1	1	x	x	x	x	x	x	x	x
19.	J Technol	1	-	1	-	A	-	x	-	x	-
20.	Math Seminar Delhi	-	3	-	3	-	A	-	x	-	x
21.	Math Stud	6	4	6	1	A	D	-	x	-	x
22.	Proc Indian Acad Sci Sec A	7	2	6	x	B	x	7	2	A	A
23.	Proc nat Acad Sci India Sec A	4	x	x	x	x	x	4	x	A	x
24.	Proc nat Inst Sci India Pt A	9	22	8	12	B	C	x	x	x	x
25.	Proc Rajasthan Acad Sci	-	1	-	x	-	x	-	x	-	x
26.	Viswakarma	-	1	-	x	-	x	-	x	-	x
	Total	85	92	46	24			26	14		
	Percentage	100.0	100.0	54.1	26.1			30.6	16.5		

TABLE 10

MECHANICS AND PHYSICO-MATHEMATICS (=B7 & B8) - TIME-LAG IN REPORTING

Difference in time-lag from the Bibliography (in months)	MATHEMATICAL REVIEWS		BULLETIN SIGNALÉTIQUE	
	1961	1962	1961	1962
2	1	-	-	-
3	2	-	1	-
5	2	-	3	3
6	1	1	7	3
7	2	1	2	3
8	9	-	3	3
9	4	5	-	1
10	3	3	4	-
11	3	4	4	-
12	2	3	2	-
13	6	2		
15	5	1		
16	2	-		
17	1	-		
18	-	1		
20	-	1		
23	-	1		
24	-	1		
35	1	-		
38	1	-		
48	1	-		
Total	46	24	26	13

TABLE 11

ASTRONOMY (=B9)- EXTENT OF COVERAGE

S. No. Title of Indian Periodical	No. of entries in the Bibliography		No. of entries covered in the Mathematical Reviews.		Extent of Reporting		No. of entries covered in the Bulletin Signalétique		Extent of Reporting	
	1961	1962	1961/63	1962/64	1961	1962	1961/63	1962/64	1961	1962
1. Curr Sci	1	-	x	-	x	-	x	-	x	-
2. Indian east Engr	-	1	-	x	-	x	-	x	-	x
3. Indian J Math	-	1	-	1	-	A	-	1	-	A
4. Indian J Met Geophys	1	-	x	-	x	-	x	-	x	-
5. Indian J Phys	5	1	x	x	x	x	5	x	A	x
6. Indian J theor Phys	1	-	1	-	A	-	x	-	x	-
7. J Indian Inst Sci	1	1	x	x	x	x	1	1	A	A
8. J Instn Engrs India gen Engng Div	-	1	-	x	-	x	-	x	-	x
9. J sci industr Res Sec A	1	1	x	x	x	x	x	x	x	x
10. J sci industr Res Sec B	-	1	-	x	-	x	-	1	-	A
11. J sci industr Res Sec D	-	3	-	x	-	x	-	3	-	A
12. Math Stud	1	-	x	-	x	-	x	-	x	-
13. Proc Indian Acad Sci Sec A	1	-	x	-	x	-	1	-	A	-
14. Proc nat Acad Sci India Sec A	1	2	x	x	x	x	1	2	A	A
15. Proc nat Inst Sci India Pt A	1	8	1	1	A	E	x	x	x	x
16. Proc Rajasthan Acad Sci	2	-	x	-	x	-	x	-	x	-
17. Sci & Cult	-	1	-	x	-	x	-	x	-	x
Total	16	21	2	2			8	8		
Percentage	100.0	100.0	12.5	9.5			50.0	38.1		

TABLE 12

ASTRONOMY (=B9) - TIME-LAG IN REPORTING

Difference in time-lag from the Bibliography (in months)	MATHEMATICAL REVIEWS		BULLETIN SIGNALÉTIQUE	
	1961	1962	1961	1962
4	-	-	1	-
5	-	-	2	1
6	1	-	-	-
7	-	-	4	4
8	-	1	-	2
10	-	1	1	-
11	-	-	-	1
20	1	-	-	-
Total	2	2	8	8

TABLE 13

DEPTH OF COVERAGE OF JOURNALS

Year of the Bibliography	No. of journals covered by the Mathematical Reviews.	No. of articles of these journals reported in the Bibliography	No. of articles of these journals covered by the Mathematical Reviews	Percentage of coverage.	No. of journals covered by the Bulletin Signalétique	No. of articles of these journals reported in the Bibliography	No. of articles of these journals covered by the Bulletin Signalétique.	Percentage of coverage.
1961	21	237	165	69.6	12	126	121	96.0
1962	18	239	163	68.2	14	140	116	82.9

TABLE 14

VOLUME-WISE ANALYSIS OF COVERAGE

Title of Indian Periodical	Coverage of the Bibliography			Coverage of the Mathematical Reviews			Coverage of the Bulletin Signalétique		
Agra Univ J Res Sci	9(1)	10(3)	11(1)	9(1)	10(0)	11(0)	9(0)	10(3)	11(1)
Antiseptic	58(1)	-	-	58(0)	-	-	58(0)	-	-
Appl Phys Quart	6(5)	7(14)	8(6)	6(4)	7(0)	8(0)	6(0)	7(0)	8(0)
Bull Calcutta math Soc	52(11)	53(10)	-	52(5)	53(7)	-	52(11)	53(10)	-
Calcutta math Soc Golden Jubilee Vol	(20)	-	-	(20)	-	-	(19)	-	-
Calcutta Stat Ass Bull	9(4)	10(8)	-	9(3)	10(4)		9(0)	10(0)	-
Cocon Bull	16(1)	-	-	16(0)	-	-	16(0)	-	-
Current Engng Pract	4(1)	-	-	4(0)	-	-	4(0)	-	-
Curr Sci	29(1)	30(2)	-	29(0)	30(0)	-	29(0)	30(0)	-
Defence Sci J	10(6)	11(4)	12(14)	10(0)	11(0)	12(0)	10(0)	11(0)	12(0)
Electro-technology	5(1)	-	-	5(0)	-	-	5(0)	-	-
Ganita	12(11)	-	-	12(10)	-	-	12(11)	-	-
Indian east Engr	103(2)	-	-	103(0)	-	-	103(0)	-	-
Indian For Rec N S Stat	1(1)	-	-	1(0)	-	-	1(0)	-	-
Indian J Math	2(5)	3(8)	4(12)	2(5)	3(6)	4(11)	2(5)	3(8)	4(12)
Indian J med Sci	15(1)	-	-	15(0)	-	-	15(0)	-	-
Indian J met Geophys	11(1)	-	-	11(0)	-	-	11(0)	-	-
Indian J Phys	34(2)	35(6)	36(4)	34(0)	35(0)	36(2)	34(2)	35(5)	36(1)
Indian J theor Phys	7(2)	8(6)	9(3)	7(2)	8(2)	9(0)	7(0)	8(0)	9(0)
J M S Univ Baroda	9(2)	10(5)	-	9(2)	10(4)	-	9(0)	10(0)	-
J aero Soc India	12(1)	13(3)	14(5)	12(0)	13(0)	14(0)	12(0)	13(0)	14(0)
J Indian Inst Sci	42(1)	43(3)	44(5)	42(0)	43(2)	44(0)	42(0)	43(3)	44(2)
J Indian math Soc	23(8)	24(32)	25(9)	23(6)	24(28)	25(9)	23(0)	24(0)	25(9)
J Indian med Prof	7(15)	8(9)	9(1)	7(0)	8(0)	9(0)	7(0)	8(0)	9(0)
J Indian Soc agric Stat	12(0)	13(7)	-	12(8)	13(0)	-	12(0)	13(0)	-
J Instn Engrs India-gen Engng Div	42(1)	-	-	42(0)	-	-	42(0)	-	-
J Madras Univ	30(5)	31(3)	-	30(3)	31(2)	-	30(5)	31(0)	-
J Sci Engng Res	4(4)	5(15)	-	4(3)	5(10)	-	4(0)	5(0)	-
J Sci industr Res Sec A	20(1)	21(1)	-	20(0)	21(0)	-	20(0)	21(0)	-
J sci industr Res Sec B	20(3)	21(2)	-	20(0)	21(0)	-	20(2)	21(1)	-
J sci industr Res Sec D	20(1)	21(4)	-	20(0)	21(0)	-	20(0)	21(3)	-
J sci Res Banaras Hindu Univ	11(2)	12(2)	-	11(0)	12(1)	-	11(2)	12(2)	-
J Technol	5(1)	-	-	5(1)	-	-	5(0)	-	-
J Univ Poona Sci Tech	N20(2)	N 22(1)	-	N20(0)	N22(0)	-	N20(0)	N22(0)	-
J Univ Saugar Sec A	7. 7 (3)	-	-	7. 7(0)	-	-	7. 7(0)	-	-
Madhya Bharati	8(5)	-	-	8(0)	-	-	8(0)	-	-
Math Seminar Delhi	2. 1(2)	2. 2(4)	-	2. 1(0)	2. 2(4)	-	2. 1(0)	2. 2(0)	-
Math Stud	27(19)	28(19)	29(27)	27(14)	28(16)	29(17)	27(0)	28(0)	29(0)
Proc Indian Acad Sci Sec A	52(1)	53(6)	54(5)	52(0)	53(6)	54(3)	52(1)	53(6)	54(5)
	55(1)	56(2)	-	55(0)	56(1)	-	55(1)	56(2)	-
Proc nat Acad Sci India Sec A	29(12)	30(3)	32(8)	29(3)	30(0)	32(5)	29(12)	30(3)	32(8)
Proc nat Inst Sci India Sec A	26(8)	26S(10)	27(25)	26(8)	26S(9)	27(18)	26(0)	26S(0)	27(0)
	28(19)	-	-	28(7)	-	-	28(0)	-	-
Proc Rajasthan Acad Sci	7(2)	8(3)	-	7(0)	8(0)	-	7(0)	8(0)	-
Res Bull Punjab Univ Sci	12(1)	-	-	12(1)	-	-	12(0)	-	-
Sankhya	22(21)	-	-	22(14)	-	-	22(20)	-	-
Sankhya Ser A	23(31)	24(16)	-	23(14)	24(14)	-	23(31)	24(15)	-
Sankhya Ser B	23(12)	24(4)	-	23(9)	24(1)	-	23(12)	24(4)	-
Sci & Cult	27(1)	28(1)	-	27(0)	28(0)	-	27(0)	28(0)	-
Vijn Parishad Anusand Patr	3(2)	4(1)	5(3)	3(0)	4(0)	5(3)	3(0)	4(0)	5(0)
Vikram Sci	4. 1(1)	-	-	4. 1(0)	-	-	4. 1(0)	-	-
Vishwakarma	11. 9(1)	-	-	11. 9(0)	-	-	11. 9(0)	-	-

Explanation:- Simple number, unless otherwise specified, indicates volume number of a periodical.
The number, preceded by a point, indicates the issue number of a periodical.
The number, within round brackets, indicates number of articles covered.
N = Number; S = Supplement.

TABLE 15

SEEPAGE AND SCATTER: ANALYSIS OF ARTICLES

Coverage of articles in different categories of periodicals 1	Year 2	No. of articles in the *Bibliography* 3	No. of articles in the *Mathematical Reviews*. 4	No. of articles in the *Bulletin Signalétique*. 5	PERCENTAGE				
					Col 3 / Total entries covered in the *Bibliography* 6	Col 4 / Total entries covered in the *Bibliography*. 7	Col 5 / Total entries covered in the *Bibliography*. 8	Col 4 / Col 3 9	Col 5 / Col 3 10
Core Periodicals.	1961	136	101	75	45.5	33.8	25.1	74.3	55.2
	1962	173	123	92	53.7	38.2	28.6	71.5	53.5
Periodicals on Broad subjects.	1961	103	54	39	34.4	18.1	13.1	53.4	37.9
	1962	86	38	20	26.7	11.8	6.2	44.2	23.3
Periodicals on Border-line subjects	1961	40	10	7	13.4	3.3	2.3	25.0	17.5
	1962	54	2	4	16.8	0.6	1.2	3.7	7.4
Periodicals on Alien subjects.	1961	20	-	-	6.7	-	-	-	-
	1962	9	-	-	2.8	-	-	-	-

Note: The *Bibliography* has covered a total number of 299 articles in 1961 and 322 articles in 1962.

TABLE 16

SEEPAGE AND SCATTER: ANALYSIS OF PERIODICALS

Different categories of Periodicals. 1	Year 2	No. of periodicals covered by the *Bibliography*. 3	No. of periodicals covered by the *Mathematical Reviews*. 4	No. of periodicals covered by the *Bulletin Signalétique* 5	Percentage		
					Col 3 / Total No. of Periodicals covered in the *Bibliography*. 6	Col 4 / Total No. of Periodicals covered in the *Bibliography*. 7	Col 5 / Total No. of Periodicals covered in the *Bibliography*. 8
Core Periodicals	1961	10	8	5	22.2	17.8	11.1
	1962	10	9	6	27.0	24.3	16.2
Periodicals of Broad subjects	1961	20	9	6	44.5	20.0	13.4
	1962	16	8	6	43.3	21.6	16.2
Periodicals of Border-line subjects.	1961	11	4	1	24.4	8.9	2.2
	1962	9	1	2	24.3	2.7	5.4
Periodicals of Alien subjects	1961	4	-	-	8.9	-	-
	1962	2	-	-	5.4	-	-

Note: The *Bibliography* has covered a total number of 45 periodicals in 1961 and 37 periodicals in 1962.

SECOND INTERNATIONAL STUDY CONFERENCE ON CLASSIFICATION RESEARCH: *

– A Review

S PARTHASARATHY
Insdoc, Delhi-12

The International Federation for Documentation has been taking a keen interest in the development of classification at international level. It organised the first International Study Conference on Classification for Information Retrieval at Dorking in 1957 in collaboration with the Aslib. Considerable progress has since been made in this subject due to the intensive work done in a number of countries. It was therefore felt worthwhile to convene a second conference to take stock of the progress made. The FID Committee on Classification Research (FID/CR) organised the second International Study Conference on Classification Research at Elsinore in September 1964 in collaboration with the Danish Centre for Documentation. The National Science Foundation, Washington, the Institut für Dokumentationwesen, Frankfurt-Main, the Danish Technical Research Foundation, and the FID provided the finances for this Conference. A number of papers were presented from India, Great Britain, France, U. S. A., Denmark, Sweden, Germany, Poland, etc. Three papers were presented from India. S. R. Ranganathan, the President of this Conference, in his presidential address surveys the progress of library classification through a century under three broad periods: pre-facet, transition-to-facet, and facet periods. His second paper is on "General and special classifications". The third paper is by A. Neelameghan on "New developments in classification in India". The number of participants at this Conference were restricted to sixty. While the first conference confined itself exclusively to the theory of faceted classification, the second conference covers a wider area and includes papers on classification, machine coding, and linguistic problems.

The proceedings of this Conference has now been published under the title 'Classification Research'. The papers are grouped under six broad heads:

1) Conference lectures: presents a panorama of the progress made in this field;
2) General theory of classification: analyses the developments in various schemes as well as techniques;
3) Research in mechanized classification: covers its scope and possibility of application of classification systems in computers;
4) Selected specialised schemes: discusses the results of the experiments carried out in special fields for retrieval of information;
5) Evaluation of techniques, comparison of systems: covers work on intellectual organisation of information, operational efficiency of retrieval systems, use of classification as an indexing device, techniques of structural linguistics in documentation research, criteria for evaluating IR systems; and
6) Directions of future work: covers new developments in classification in India, standardization for classification in computerised documentation systems.

The papers cover a wide range of the subject. The foremost thinkers in the field have been brought together in this Conference for intimate discussion and exchange of ideas. The discussions reproduced along with the papers add considerable value to the pro-

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*Classification Research: Proceedings of the Second International Study Conference held at Elsinore, Denmark, 14–18 September 1964. Published by FID/CR Committee on Classification Research and edited by Pauline Atherton. Copenhagen, Munkagaard. 1965. Pp. x + 563. Price 84 Danish Kr.

ceedings and highlights some of the problems presented in the papers. The recommendations made at this Conference spell out the new directions in which research on classification have to be carried. They embrace theoretical research, application of theoretical studies, evaluation of classification systems and automated classification. The major recommendations are reproduced below:

THEORETICAL RESEARCH

The existing body of theory is in need of further elaboration on various lines, for both general and special classification systems as well as for such established applications as shelf arrangement, card catalogues, indexes, and bibliographies on the one hand and machine systems of various degrees of mechanization and automation on the other hand.

This theoretical approach embraces among other things: the study of the mutual interrelationships between thought and language, i. e., the connection between concepts, relations between concepts, and their expression in the natural language; the linguistic study of terminology in scientific and technical fields; the construction of controlled vocabularies, thesauri (with or without hierarchical relations expressed) as well as classificatory pre-coordinated structures; the study of various methods for embodying "analytic" relations given by context (so-called syntactical structures); the analysis and evaluation of the functional relationship between the various components of systems (including classification, codes, and equipment); the study of the behavioral processes, e. g., the inductive processes (both at the individual and group levels), which largely determine the choice of semantic categories.

In this connection, a number of specific questions relating to classification theory should be investigated further, such as:

a) the possible separation of paradigmatic and syntagmatic relations;

b) the use of universally applicable categories or categories applicable to several fields;

c) the domains of application and conditions for the use of integrative levels;

d) the formal (mathematical and logical) foundations of classification;

e) the relevance of a classification system to the subject being classified, taking into account related semantic questions from the socio-psychological point of view;

f) data classification (look-up systems) as contrasted with document classification;

g) the optimal stage of precision in classification language when expressing complexity.

At the frontier of theoretical research and practical application we should investigate:

h) symbolization (notation) problems;

i) relationship between "general" encyclopedic classification schemes and "specialized" classification schemes.

APPLICATIONS

Theoretical studies mentioned above should be applied to:

a) the improvement of existing classification, including work on methods for construction of thesauri and related tools;

b) the achievement of better design in new classifications;

c) the exploration and implementation of compatibility among classification systems and thesauri, including standardized vocabularies;

d) the convertibility of the records of material indexed in one system into another;

e) the study of the interaction between the classification systems and computer technology in the process of system analysis and programming; and the effects of the cooperation between the classificationist and the systems engineer.

EVALUATION OF CLASSIFICATION SYSTEMS

The objective of work in this area should be to obtain generally recognized and standardized techniques for evaluation as well as the measurement of the dimensions of a classification system. It is necessary to devise:

a) more adequate experimental and operational test designs;

b) better evaluation techniques;

c) mathematical models for the more precise and reliable description of systems;

d) better methods for the comparison and evaluation of classification systems.

Tests and evaluations of existing systems in a variety of disciplines should be encouraged. An international cooperative effort should be made on collections of sufficiently large size to test the utility of classification systems. There is a need for further work along these lines:

e) tests which include the users of classification systems, the classifiers and indexers, and to uncover divergencies between index description and the author's own analysis of his paper;

f) studies of the reliability and consistency of results of classification performed by different classifiers within one classification system and/or various systems;

g) more precise and reliable methods of measuring documentary relevance to search queries.

AUTOMATED CLASSIFICATION

The problems related to the construction and possible application of automated classification could have appeared under all the preceding headings, but the high level of interest in this area at this time called for special and separate treatment.

Automated classification includes: 1) the mathematical derivation of classification schedules (the work of the classificationist), and 2) the automated assignment of documents to categories (the act of classing, which is the work of the classifier), regardless of whether the categories were automatically derived or were chosen from a classification scheme previously devised.

The automated assignment of documents using a previously devised classification schedule is already operationally feasible. The other kind of automated classification has been subject to some experimentation. Further experimentation on an adequate statistical basis is desirable in order to determine the scope and limitations of these procedures in comparison with other classification methods. Statistically reliable studies are needed to determine how the automated classification compares with the human classifier and with the vocabulary distribution in the document.

The Conference also makes a number of recommendations for proper coordination of work at international level and collaboration between various workers in this field. This publication is a major contribution in the field of classification and will continue to be an important source-book on this subject. We have to congratulate the organisers, particularly the members of the FID/CR Committee on Classification Research, for arranging this Conference and for bringing out the proceedings in a most expeditious manner. The credit for the excellent editing goes to Pauline Atherton. The novel art work by R. Fairthorne at the beginning of each section adds wings to a slow moving subject and takes it to higher flight. The publication is very well brought out and excellently printed.

CURRENT DOCUMENTATION LITERATURE

CDL is an index to current periodical literature in Library Science, Documentation, Reprography and Translation. This index is mainly intended to serve the professional needs of librarians, documentalists and students. An attempt is made to minutely classify the articles. This experiment, we hope, will throw some light on the many problems of library classification and eventually lead to acceptable solutions.

This issue carries 272 entries of original and informative articles published currently in periodicals in the English, some of the other European and Japanese languages totalling 32.

The arrangement of entries is according to the Colon Classification ed 6, 1963, supplemented by the tentative depth schedules for classification, cataloguing and bibliography published earlier in the Annals, and for book science published recently in Library Science with a slant to Documentation. Slight changes have been made in the use of these schedules. An attempt has been made to give coextensive class numbers to the extent possible. It is proposed, however, to develop finally, elaborate schedules for this purpose, on the basis of our experience in the compilation of this list.

We earnestly hope this feature in the Annals will be received well by the subscribers. Any suggestions to improve the quality of the index will be very welcome and thankfully acknowledged.

Compiled by:

ARORA G K
GUHA B
KAMALA PADMAGIRISWARAN
RAJAN T N

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2084 DEIGHTON L C: Books, not copying machines, are the long-term answer. Lib J 1965, 90 No 9, 2087-92.

INDIAN SCIENCE ABSTRACTS

The need has been felt for a long time for a bibliographical periodical covering the entire scientific output of the country quickly and comprehensively. The Conference of Information Scientists convened by the Council of Scientific & Industrial Research in Mysore during 1963 realised this need acutely and directed the Indian National Scientific Documentation Centre (INSDOC) to take immediate action for ensuring bibliographical control of scientific publication in India.

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annals of library science and documentation

VOL 12 NO 3 SEPTEMBER

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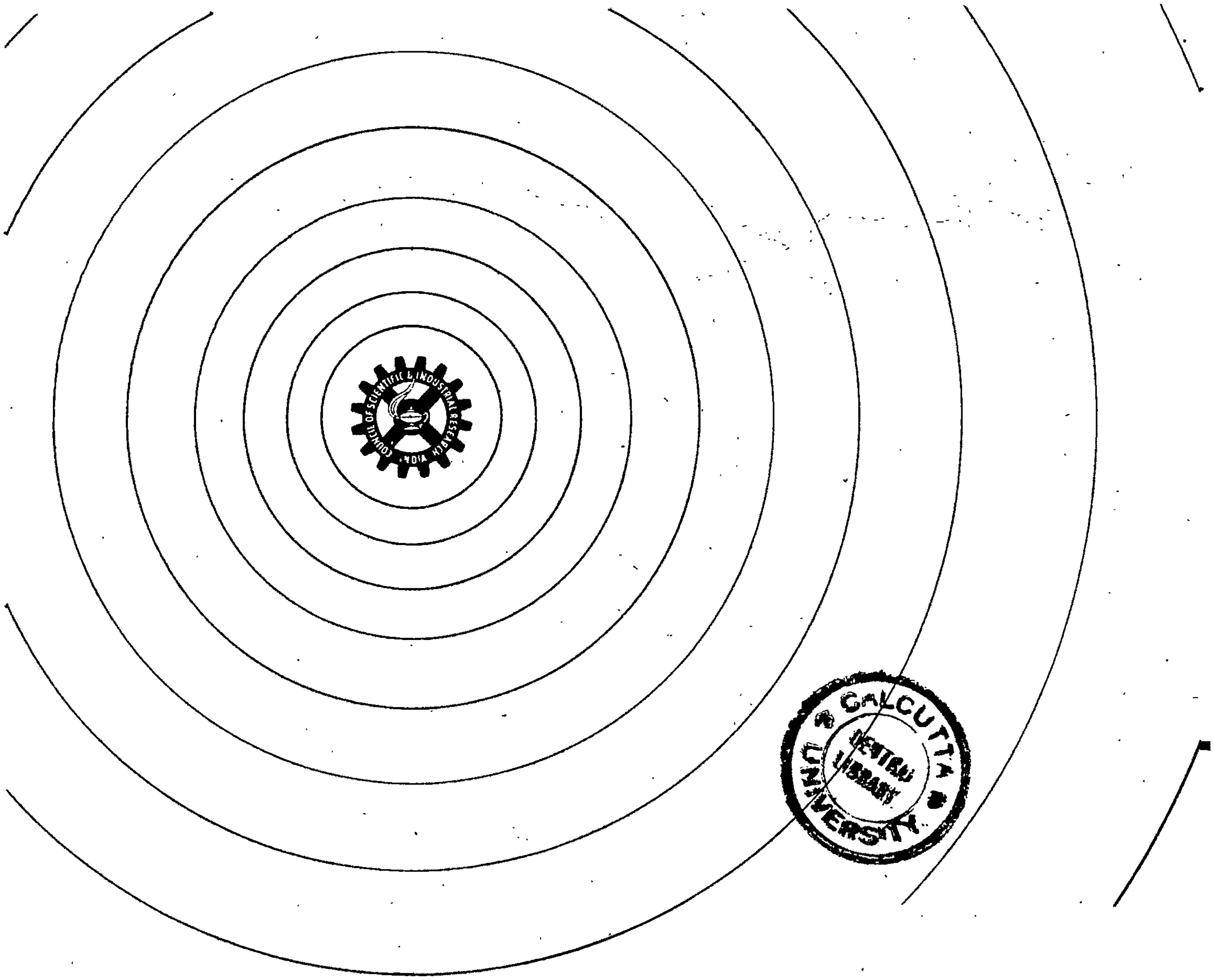
Edited, printed and published by S. Parthasarathy at Insdoc, Hillside Road, Delhi 12.

14 DEC 1965



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annals of library science and documentation

INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE DELHI - 12

VOL 12 NO 4 DECEMBER 1965

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Annals of Library Science and Documentation is a Medium for publishing original contributions in the field of library classification, cataloguing, bibliographic organisation, documentation techniques, mechanical methods of documentation, bibliographic standardisation, etc.

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	U.S.A.	$ 3
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a criterion for further evaluation. The two major points driven home by this report to those in authority were that except in respect of Australian, and to a much lesser degree South East Asian material, there were no great research collections in Australia such as would attract scholars from overseas. The other point was that national achievement in the scientific, technological, economic, educational and other fields, was very much

[redacted]

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c) That the Minister be advised that AACOBS is aware that a recommendation has been made which may result in a similar grant to

[redacted]

resources. It is true our difficulties in this country as regards priorities for food and shelter are acute, but it must be realised that whereas hungry stomachs and clogged drains might be dangerous, clogged brains might result in a shattering explosion fatal to the whole community.

the australian national library

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economic development of Britain and Ireland during 1650 to 1870 represented by a

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contempt of familiarity. He brought this out very clearly in his lectures at Rutgers University speaking in the third of the series of seminars on Intellectual Organisation of

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KESAVAN

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Public Library, the Fisher Library at Sydney and the New South Wales University Library, the writer could well understand the complex that Sydney suffered from vis-a-vis the creation of the National Library at Canberra!

THE CSIRO

I had particularly requested the Australian Government that I should be afforded an opportunity to observe the impressive set-up of C.S.I.R.O. Documentation, and that meant a journey to Melbourne. But alas! it also spelt the missing of a rewarding experience in Tasmania. My heart had warmed up towards Tasmania when I met the distinguished President of the Australian Library Association in India, Justice Crisp, and his charming wife. When I listened to the Presidential address of Justice Crisp at the Conference, I felt a twinge at having to miss what in Australia has been considered the finest public library service. But my own stewardship of a documentation centre in India demanded that I should profit by observing the work of Miss Doubleday whom I had already met during a brief visit of hers to Delhi. The no non-sense, down-to-earth manner of Miss Doubleday when she discussed matters with me at Delhi and her own warm invitation that I should call on her if ever I got to Australia, were factors that decided my giving Tasmania the miss. I shall continue to regret this for all time, though my visit to Melbourne was exceedingly rich in experience.

Among the many people to-day who are taking the bread out of men's mouths, I found Miss Doubleday was in the forefront in her establishment at the C.S.I.R.O! I was the only male around the place! It is true, just to correct that impression, later in the afternoon, she did introduce me to a whole roomful of men engaged in scientific activity, and just to offset the impressions produced during the day, she was the only senior woman officer present in that gathering! The other thing that I learnt during that visit was that there are really more than sixty minutes to the hour, in the working day of Miss Doubleday and her colleagues! Her organisation is an impressive example of how much can be done by how few. Her union catalogue is an achievement worth the world's respect. The only bit of mental reservation I have about that catalogue in loose leaf form is that all is very well only as long as the individual librarian has a nagging conscience and files them properly! Her exchange section, which gets into the country scientific serials from all over the world in exchange for Australian serial publications is exceedingly well-organised. The routines that she has worked out for dissemination of information within the complex of the C.S.I.R.O. has about it a simplicity and a lack of fuss which taught me quite a few things. At the end of my day in her organisation, I went home with an admiration for her organising capacity and with a prayer in my heart that I was glad I did not have her to over-see my work! I hope very soon to go into the details of her organisational working in a separate contribution in these pages.

THE MONASH & LA TROBE UNIVERSITY LIBRARIES

The Monash University Library is under the stewardship of Ernest Clarke, a man with a fine sense of humour and a very un-Australian phlegm. He was my host at Melbourne and I am grateful to him for the rewarding time I had in that beautiful city of parks and wide roadways. A lovely beginning has been made as regards the building for the university library, and the plans for the future extension of it, when realised, will give Australia one of its most attractive library buildings. My own involvement in Monash was to help out the Department of Indian Studies with some advice as to how they could procure the sort of material that they wanted.

I had always met university librarians in the context of their universities and their libraries. But here in Melbourne, I was to meet a very stimulating personality who has the enviable but difficult job of finding the bricks for his building! He is also to create the collections for the university library! This person was D.H. Borchardt, the first Senior Officer appointed by the authorities of the La Trobe University. Borchardt is unorthodox in a number of ways and there is very little distance between his heart and the tip of his tongue! It is a joy to listen to him, forthright in his comments, and with scant respect for established reputations. I spent a delightful day with him being taken round sheep-folds that were yet to be converted into the university campus. I listened with great interest to his experiences in Turkey where he had spent a year as a Unesco expert. Another point of contact between us was a common friend of ours, now the Head of the Department of Library Science in Mysore University, Mr. Patil, who worked with Borchardt for quite some time.

From Melbourne I should have gone on to spend some time at Adelaide, but unfortunately the alarums and excursions at home were such that I had to cut my visit short by quite a few days and miss Adelaide, though Mr. Raymond did me the courtesy of meeting me at the airport.

The exciting days of the Conference, the glorious experience of human, mechanical and electrical engineering in the snowy mountains, the meetings with the Librarians in the various cities of Australia — all these have been very rewarding experiences and have built up nostalgic memories. If the question is asked as to what my impression was about the development of librarianship in Australia, I would say that everywhere there is an acute realisation on the part of the people and the authorities as to the importance of libraries and librarians at all levels. What is their contribution, do you ask, to library science? The answer is that their emphasis is on library service, and the development of library science is with them a corollary following upon pragmatic experience. They have neither the time nor the patience at the moment to evolve independent concepts in the realm of classification. A couple of libraries have been classified by Bliss and they are rethinking themselves out of it. The Universal Decimal Classification for Science, the Library of Congress Classification and the Dewey Decimal Classification are all being accepted with quite an awareness of their limitations, but with the feeling that these could be made to work without any precious criticisms about their not meeting the needs of the hour. Metcalfe thinks and writes brilliantly, but he is far from having established any school of his! I would like to see an Australian librarian do it! There are many others whom I have had the pleasure and privilege of meeting, than those rehearsed in the paragraphs above. The quiet and massive work that Athol Johnson is doing at the National Library, the dedicated work, both as a Librarian and as an Editor of the Australian Library Journal, of Jean Whyte, the wonderful Key-Murray combination at the Parliament Library, the active work in library fields of Jean Hagger who took personal charge of me for a whole day, Prof. Greenwood and his Indian colleagues, Mr. Singhal and his wife at Brisbane with their deep interest in Indian studies — these are all things to remember. Everywhere I went, the care and consideration lavished on me was overwhelming. Jean Whyte was particularly anxious that I should not starve myself out in Sydney because I was a vegetarian, and she bought up a whole fruit shop for my benefit and left it on my table, and I must say I did enjoy it!

PROF. TRENDALL

But most wonderful of all was the gracious courtesy of Prof. Trendall, the Master of University House at the Australian National University. After a first week at a very comfortable hotel, to my great joy, I was shifted over to the University House which is a very pleasantly wrought building. When I staggered in with my bags, a most benign expression at the counter greeted me. Every detail about my accommodation was rehearsed to me, including the fact about the receipt of my daily newspaper. I was given the keys and personally shown round the place and taken to my room by this gentleman. He even offered to carry one of my bags to relieve me of the burden! All the while I was aware of an academic grace and chasteness in his enunciation. I could not quite place him, but I profusely thanked him for his solicitude. The next morning when I opened the papers, I found the same benign expression in a photograph being decorated by an European Ambassador for his great contributions to scholarship, and then I realised that this remarkably kind, solicitous, unassuming, unpompous person was none other than Prof. Trendall! My thoughts for a moment dwelt on the very unlikely prospect, in many countries, of a scholar of such great distinction offering to carry the bags of a guest and show him his rooms and acquaint him with the details of routine! And when I learnt that he was also Vice-Chancellor of the Australian National University before he became Master of the University House, I marvelled all the more!

ELIZABETH WHITE

I left to the very last one name which I now mention with the greatest affection and regard. From the moment I landed at Canberra till the last minute of my stay in that lovely city, I was looked after by this most gracious of persons in a way which I can never easily forget. Elizabeth runs the man who runs the National Library of Australia, and in that simple statement you can find the reason for Harold's great success in his work. A lovely home in a lovely garden, presided over by Elizabeth whose day is full of good works done in the interests of some cause or the other, but never so full a day as to neglect in any way the friends that Harold surprises her with at lunch or dinner or tea, is a very great asset for a man with a national responsibility. I watched her in action at Paris, at New York and again at her own home and then I knew that with a home base such as this, Harold could not but score his homers!

ACKNOWLEDGMENT

Photographs of:	by Courtesy of:
1. Fisher Library	1. Mr. Harrison Bryan
2. Library of the University of Western Australia	2. Mr. L. Jolley
3. The Commonwealth Australian National Library & Mr. H.L. White	3. Mr. H.L. White
4. Sir John Ferguson	4. The Australian High Commission
5. Mr. C.A. Burmester	5. Mr. C.A. Burmester

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classification research:

A SURVEY OF RECENT DEVELOPMENTS

S PARTHASARATHY
Insdoc, Delhi - 12

Surveys the work done and the trends in Classification Research during recent years. The role of the FID and some national bodies in the promotion and development of a general theory of classification is discussed. Successful design of a number of special schedules has highlighted the need for developing a general scheme of classification. Concepts like the Integrative Levels and the Inductive leap factors are some of the results of new thinking in this field.

In recent years, there has been a considerable spurt of activity in the field of classification research. There are a number of factors which have contributed to this: the interest of the International Federation for Documentation, the active work done by a number of national groups, the teaching programmes developed by universities in the field of advanced techniques in documentation, the projects taken up by research institutions for organisation of information retrieval, the extensive financing by defence organisations for effective dissemination of information, the support by Foundations for advancing the frontiers of knowledge in this field and lastly the impact of computer techniques for information processing. With the advent of computers, there was a strong feeling that the conventional classification techniques would in due course lose their ground for the more sophisticated computer techniques in the field of information processing and retrieval. The developments during the last ten years have emphasised the need for further work in the field of classification even for computer work. Already some experiments have been conducted utilising classificatory approach for computer searching. This will give further fillip for active research in classification.

ROLE OF THE FID

The International Federation for Documentation has been taking a keen interest since its inception in the development of the Universal Decimal Classification. It had set up a number of committees consisting mostly of subject specialists for the development of the UDC schedules in specific areas. In addition, a general committee FID/CCC Central Classification Committee was looking after the problems arising from the work of the various committees. In the process of building schedules in specific fields, the FID has built up a corpus of theory on classification. The late Donker Duyvis was for a number of years closely associated with this work of development of the UDC. In spite of his close identification with the UDC, he realised the need for the development of a general theory of classification at an international level. Immediately after the Second World War, when the FID was again rehabilitated, he approached the leading thinkers in the field of classification and requested them to contribute comprehensive papers on the theoretical aspects of their schemes. In response to this invitation, Henry Evelyn Bliss of U.S.A., S.R. Ranganathan of India, Eric de Grolier of France, etc., contributed special papers on their schemes, which have been brought out as special publications of the FID[1]. This attempt was very useful, as it brought together the works of various exponents in classification for a comparative study. As a follow-up, Donker Duyvis arranged a special session on classification at the Rome conference of the FID in 1951. A number of papers were received from many countries, including India.

FID COMMITTEE ON GENERAL THEORY OF CLASSIFICATION

As a next step and due to the initiative of Donker Duyvis, a new committee was set up by the FID for general theory of classification, namely FID/CA, and Ranganathan was made its Rapporteur General in 1951. Eleven annual reports[2] covering Ranganathan's contribution on the various aspects of classification, such as mixed notation and zones in any array, zone analysis and efficiency table, classification of commodities and services, classification of environmental entity, classification and retrieval, telescoping of facets and mixed notation, and facet sequence and telescoping in schedule, were submitted to the FID.

INDIA

The work in India on classification research has been progressing vigorously during this period. The theory of classification was considered from the point of view of idea plane, notational plane and verbal plane. This approach clarified many of the terminological difficulties encountered in discussing a problem and stressed the need for having a precise terminology for the three different planes. During this period a number of notational techniques were introduced and a set of postulates was developed for classification work. The work on classification theory was systematically discussed every week by the Classification Research Circle in Delhi. The annual reports of the FID/CA represented the results of this group.

U.K.

The Scientific Information Conference held in London in 1948, and the recommendation of the Royal Society for setting up a Standing Committee on subject classification in science stressed the importance of research in classification. A group of British librarians in London organised the Classification Research Group (CRG) in 1952. This group was also attracted by the work done in India and was influenced by the results achieved. The object of the CRG was to make a systematic study of the theory of classification, without being attached to any particular scheme for their work. They wanted to pursue their work to analyse the problems in classification without in any way committing themselves to one scheme. However, their work was on developing faceted classification. Naturally they drew heavily on the results of the work done in India. They experimented by developing classification schemes for special subjects such as music, occupational safety and health, social sciences, etc. based on faceted principles but using different notational techniques. Vickery, Coates, Foskett, Barbara Kyle, Farradane, Mills, Fairthorne, Wells, Palmer, etc. contributed substantially to the activities of this group and got international attention. The results of their discussion were published as minutes of the CRG and circulated to persons interested in the field. Later on the minutes were published in the Journal of Documentation.

DORKING CONFERENCE

This effervescence in the field of classification research gave an opportunity for the FID to convene an international study conference. The annual reports of the FID/CA were usually taken up for consideration at each of the annual conferences of the FID which were mostly held in Europe. Due to lack of adequate number of delegates interested in classification attending these conferences, the FID/CA reports could not be taken up for discussion and even on occasions when a session was devoted to the discussion of this topic, the difficulties due to language, technical terminology etc. hampered a fruitful discussion of the topic. It was with a view to overcome these difficulties, Donker Duyvis took the initiative for organising a study conference on general theory of classification. Aslib, London, in collaboration with the Classification Research Group and the University of London School of Librarianship and Archives agreed to play the host for this study conference. This formed a forum for putting across the development made in the field of general theory of classification by the groups in India, in the United Kingdom, in Europe and in the United States. Ranganathan, who was the Rapporteur General of the FID/CA was nominated as the Chairman of this conference and his key-note address gave the work done by his school in India and isolated problems for future research on the basis of work already done. The papers from Britain represented an account of the problems studied by the Classification Research Group, London, and described some of the faceted schemes developed by this group, using non-hierarchical or non-structural notation. The contribution from France referred to the theoretical study of Eric de Grolier in classification. The American contributions related to historical treatment as well as use of classification in information retrieval. The presentation of papers and the discussions on them brought out an understanding of the problem and stressed the need for further work by all the groups for developing this field. The recommendations made at this conference analysed and enumerated a number of problems to be pursued and stressed the need for international collaboration for furthering this work.

RESEARCH PROJECTS

The Conference recommended a number of research projects to be conducted, on the lines indicated below[3].

a) "elaboration of schedules of classification for the more general categories usable in many different fields of knowledge (logical, morphological, spatial, lists of properties, values, and materials, etc.);

b) clarification of the problem of relations between subjects, and of the nature of connecting symbols necessary for expressing them;

c) study of the different methods for coping with the increasing overlapping between areas of knowledge; and

d) establishment of a unified systematic terminology in the field of classification theory itself".

It also recommended setting up of research groups in various population centres.

U S GROUP

As an offshoot of this Conference a study group was also formed in the United States to work on classification theory. The reports of the work of this group were presented in some of the conferences of the American Library Association.

ASLIB-CRANFIELD EXPERIMENT

Another important result of this Conference was a project supported by the National Science Foundation for testing the efficiency of various techniques of information retrieval in a specific field, viz. aeronautical sciences. In this experiment, carried out at Cranfield, in collaboration with Aslib, the comparative efficiency of retrieval techniques, such as the conventional alphabetico-subject catalogue, faceted classification, coordinate indexing using uniterm and UDC were studied. The faceted classification for aeronautical sciences was specially designed by Vickery and Farradane. The results of the experiment have been published[4] and they indicate that all the methods are more or less equally efficient but coordinate indexing has a slight edge over the others. The Aslib-Cranfield experiment was the first attempt for comparing the efficiency of four different systems of information retrieval. The experiment has been conducted under controlled conditions. The methodology developed for comparing different systems is unique. There has been considerable amount of literature on this experiment.

DEPTH CLASSIFICATION

Classification research in India was continued in the newly started Documentation Research and Training Centre (DRTC) at Bangalore under the guidance of Ranganathan. The teaching of the new principles evolved so far gave further clarification and insight into the building up of depth schedules for specific subjects. The postulational approach to classification was developed still further, by addition of a few more postulates and the guiding principles for facet sequence were also developed. The concept of the basic class was clarified. The use of postulational approach and guiding principles was considered as a necessary feature of an analytico-synthetic scheme of classification. This was the basis for differentiating between a faceted scheme and an analytico-synthetic scheme. Mere provision for the combination of facets alone will not make a scheme an analytico-synthetic scheme. In addition to the provision for faceting, a scheme based on analysis of a subject and construction of class number using a set of postulates and guiding principles can be called an analytico-synthetic scheme. This emphasises the necessity for a preliminary analysis and later on synthesising them as a necessary criteria for any analytico-synthetic scheme. The Universal Decimal Classification which has provision for facetisation only, is a faceted classification whereas the Colon Classification which has provision for facetisation as well as for analysis and synthesis on the basis of postulates and guiding principles, is an analytico-synthetic classification.

SPECIAL SCHEDULES

On the basis of the work done at the DRTC, a number of special schedules[5] have been built up for depth classification in the field of production engineering of: reciprocating internal combustion engine, gas turbine engine, transistor, radar, etc.

NOTATIONAL TECHNIQUES

The experience gathered in the building up of these schedules has enabled further sharpening of the notational techniques. The concepts of emptying and empty digits have brought in additional capacities for interpolation between any two isolates in an array [6]. Formerly, the extension of an array was possible towards the end of a sector but not between any two digits in a sector. The octave device using nine as a dummy digit was for this purpose. Now the concept of emptying digit enables one to interpolate a new isolate between any two points in an array. Formerly it was not possible to interpolate a new main class in the array of main classes. In the Colon Classification such an interpolation was made possible by using a new species of symbols such as Greek letters. But the difficulty in using a new species was an arbitrariness in the fixing of the ordinal value of the new species in an array. Such an interpolation appeared rather artificial, but this solution had to be accepted to meet the needs of literary warrant. The concept of emptying digit eliminates the use of new species in an array for interpolation.

DESIGN OF A SCHEME

Another area where considerable work has been done is the design of a scheme of depth classification in special fields[7]. This is entirely based on postulates, laws and principles. It provides a systematic approach for building up of a schedule in any subject field. It provides a step by step procedure for the analysis of a subject, grouping the products on a helpful basis and allocating them to the various facets on the basis of fundamental categories. The facet sequences are determined using the guiding principles developed so far.

GLOSSARY OF TERMS

As a part of systematisation of the work done so far and to enable a proper understanding of the contributions made in the field of classification a need was felt for drawing up a glossary of technical terms used in this discipline. The General Assembly of the FID at its meeting held in Brussels in 1955 stressed the need for preparing a glossary of classification terms. And in 1957 it was recommended that, as a first step, each school of thought on the theory of classification should prepare a glossary of terms used by it. This work pertaining to India was taken up by the Documentation Committee of the Indian Standards Institution. A glossary of classification terms has now been published[8]. This is a very useful contribution and will form an important reference book for understanding the work done in India in the field of classification research.

FACETED SCHEMES

The British group has developed a number of faceted schemes for specific subjects using the classificatory techniques developed so far. Faceted schemes were worked out for astronomy, engineering, aeronautical sciences, nuclear energy devise, container manufacture, and recently library science[9].

GUIDE FOR CONSTRUCTION OF FACETED SCHEMES

The building up of the faceted schemes in various subjects has resulted in the preparation of a guide to construction and use of special schemes according to faceted classification. This has been brought out by Vickery for the Classification Research Group[10]. It examines the techniques of facet analysis, choice of subject field, formulation of categories of facets, function of notation, allocation of numbers to terms, procedure for classifying, etc.

NEED FOR A GENERAL SCHEME OF CLASSIFICATION

The working out of special schedules for various subjects has brought out some new concepts in classification. The Classification Research Group, London, has been discussing the implications as well as application of these concepts. Though the faceted schemes developed so far for special subjects have been useful and effective, the need for developing a general scheme of classification is felt more and more. A consolidation of the special schemes, however efficient, would not constitute a general scheme of classification. Even in special libraries where the faceted schemes are used, there is a need for accommodating books belonging to border line subjects which cannot be appropriately accommodated by the individual schemes. Therefore there is a real need for a general scheme of classification. The conventional schemes of classification used in general libraries have not been giving satisfaction. The structure of these schemes based on the state of knowledge prevailing at the end of the last century have not been able to keep pace with the rapid development of knowledge during recent years. To make the conventional schemes perform functions not in-built in them ends in unsatisfactory performance. It is therefore necessary to build afresh a general scheme of classification suitable for modern conditions and based on sound and valid principles.

THEORY OF INTEGRATIVE LEVELS

The recent work of the Classification Research Group is worth examining in the above context. They have been considering the 'theory of integrative levels' as a basis for the development of general classification scheme. This has been well brought out in Foskett's paper on "Classification and Integrative Levels" published in the Sayers Memorial Volume[11]. According to him: "The theory of integrative levels is that the world of things evolves from the simple towards the complex by an accumulation of properties, and that, at succession of levels, these aggregations reach new degrees of complexity and become new wholes, with individual and unique identities. Each whole is greater than the sum of its parts, and ceases to possess its identity if broken down again. It acts as a unit, and the units at each level can engage in processes characteristic of that level; an influence acting on one part of the unit affects the whole unit, even though other parts may continue to function as before... This theory can readily be used to divide a list of things into a succession of groups, each containing members of the same level of organisation. By adding, to each group of things, categories of properties of the Things and of Processes in which they engage as individual wholes, a pattern results which is clearly similar to the Personality and Energy facets of the Colon Classification". According to this theory one could start with the fundamental particles and by addition of appropriate properties arrive at nuclei and by repeating this process get at various stages atoms, molecules, molecular assemblages (natural objects and artefacts), cells, organisms, human beings, human societies, etc. These levels are considered as distinctive and are greater than the sum of the parts constituting them at each level.

NATO CONFERENCE ON CLASSIFICATION

On the basis of the work done by the Classification Research Group, a conference was organised in 1963 on the "design of a general classification scheme" by the Library Association, London, with a grant from the Scientific Research Fund of NATO[12]. Papers by Foskett, Kyle and Coates examine the use of 'integrative levels' as a basis for developing a general classification scheme. According to them, the main classes in the conventional schemes are chosen arbitrarily and "no prescriptive combination order can be given for the citation of composite subjects with elements drawn from more than one main class. The CRG thinks it essential that this particular arbitrary factor shall not appear in the new scheme"[13]. An outline of the scheme of integrative levels developed by the CRG is as follows:

0	
01	
02	
1	Fundamental particles
2	Nuclei
3	Atoms
4	Molecules
5	Molecular assemblages (natural objects and artefacts)
6	Cells
7	Organisms
8	Human beings
9	Human societies

The combination order of elements from various levels will be from 9 to 0, i.e. from the bottom of the table upwards. For example, "human biochemical interactions which is a combination of elements drawn from 8, 7, and 4, respectively, will be located in 8 and its combination order is represented by 8x, 7y, 4z, where x, y, z, stand for particular concepts to be found within the levels indicated. General biochemistry will be represented by 7y, 4z and chemistry by 4z"[13].

We have to examine carefully the utility of the theory of integrative levels as a basis for designing a general classification scheme. The approach sounds rational. But its utility beyond securing a definite combination of order of elements from various levels, has to be demonstrated.

INDUCTIVE LEAP FACTORS

Richmond elaborates the theory of integrative levels by examining the factors involved in the formation of different levels of aggregates from particulars[14]. According to her, the formation from parts to whole or from particulars to general involves an 'inductive leap' similar to induction in scientific method. There are factors which bridge the inductive leap from particular to general, i.e. from lower to higher integrative levels. Usually several factors are involved. It will be necessary to explore this aspect and analyse all our class structures in relation to inductive leap factors. This would make building up of classification schedules much more explicit and scientific than at present. It will provide a systematic approach and rationalise solutions which are now considered as the result of intuitive approach.

The theory of integrative levels and the concept of inductive leap factors are examples of new thinking in the development of a theory of classification. But these concepts, as formulated at present, are still in a nebulous state. How far they will be practicable can be seen only be further application.

ELSINORE CONFERENCE

The Dorking Conference organised in 1957 ushered a new era in classification theory. It was stated by De Grolier that the work in the field of classification had achieved sufficient maturity as to give it the status of 'new classification'. Since then there has been a spurt of activity not only in the field of classification theory but also in the related fields of information retrieval. The International Conference on Scientific Information held in Washington in 1958 focussed attention on mechanical methods of retrieval. The Conference on Processing of Information held at Unesco in 1959, devoted most of its attention to the use of computers for mechanical translation and information retrieval. In view of these trends, the FID reconstituted its Committee on General Theory of

Classification (FID/CA) to take within its ambit the subject of mechanical information retrieval also. The committee was reconstituted as FID/CR Committee on Classification Research. As a mark of recognition of the work done by Ranganathan, he was elected as an Honorary Chairman of the FID/CR. The second International Study Conference on Classification Research was organised at Elsinore in September 1964 by this Committee. The proceedings of this Conference bring together the latest contributions in the fields of general theory of classification, research in mechanized classification, specialised schemes, evaluation techniques and comparison of systems and new developments in classification.

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CURRENT DOCUMENTATION LITERATURE

CDL is an index to current periodical literature in Library Science, Documentation, Reprography and Translation. This index is mainly intended to serve the professional needs of librarians, documentalists and students. An attempt is made to minutely classify the articles. This experiment, we hope, will throw some light on the many problems of library classification and eventually lead to acceptable solutions.

This issue carries 546 entries of original and informative articles published currently in periodicals in the English, some of the other European and Japanese languages totalling 51.

The arrangement of entries is according to the Colon Classification ed 6, 1963, supplemented by the tentative depth schedules for classification, cataloguing and bibliography published earlier in the Annals, and for book science published recently in Library Science with a slant to Documentation. Slight changes have been made in the use of these schedules. An attempt has been made to give coextensive class numbers to the extent possible. It is proposed, however, to develop finally, elaborate schedules for this purpose, on the basis of our experience in the compilation of this list.

We earnestly hope this feature in the Annals will be received well by the subscribers. Any suggestions to improve the quality of the index will be very welcome and thankfully acknowledged.

Compiled by:

ARORA G K
GUHA B
KAMALA PADMAGIRISWARAN
RAJAN T N

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30 APR 1966

annals of library science and documentation

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Edited, printed and published by S. Parthasarathy at Insdoc, Hillside Road, Delhi 12.